ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXV, No. 6. CHICAGO, SATURDAY, AUGUST 8, 1914. ISSUED WEEKLY.

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer.

A. A. Gray, General Manager. H. S. Tuthill, Business Manager.

C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich.....Associate Editor
Chester A. Gauss.....Assistant Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
- Effect of European War on the Electrical Industry..... 257
- Electric-Vehicle Data 258
- Home Rule and State Regulation..... 259
- Regulation and Incandescent Lamps 259

DEPARTMENTS:
- Commercial Practice 268
- Electric-Vehicle Data 270
- Electrical Construction..... 271
- National Association of Electrical Inspectors..... 276
- Public Service Commissions..... 278
- Questions and Answers..... 280
- New Electrical and Mechanical Appliances..... 291
- Latest Approved Fittings..... 296
- Current Electrical News..... 298
- Record of Electrical Patents..... 303

LEADING ARTICLES:
- Electricity in Laundries 263
- Electric Devices Used in Store-Front Publicity..... 268
- Electrical Wiring in a Hospital..... 271
- The Indeterminate Franchise or Permit.—II.—By Halford Erickson 283

MISCELLANEOUS:
- New England Section Convention..... 260
- Electric Club Picnic..... 260
- Colorado Association Convention..... 260
- New Power Station at Newark..... 260
- Electric Show at Northwest Convention..... 260
- Third Congress for Radioactivity..... 260
- D. A. Hegarty 261
- Electric Vehicle Association of America..... 261
- Accrington Mond Gas-Electric Plant..... 262
- Electrical Vehicles in the Brewing Industry..... 270
- Salt Lake City Contractors Have Successful Lunches..... 273
- Wiring in Old Houses..... 274
- Lighting a Stone Yard..... 275
- Water Cooled Rheostat.—By H. W. Parsons..... 275
- Among the Contractors..... 275
- Meeting of Massachusetts Electric Lighting Association.. 281
- British Telegraphs 285
- Improvements in Long-Distance Telephony..... 286
- Lighting of the Tower of London..... 288
- The Electric Commercial Vehicle vs. the Horse..... 290

Copyright, 1914, by Electrical Review Publishing Company, Inc.

EFFECT OF EUROPEAN WAR ON THE ELECTRICAL INDUSTRY.

The tremendous conflict which has been precipitated in Europe by the action of Germany and Austria, and which seems about to convulse almost the entire continent in the throes of war, cannot but have a marked effect upon the business not only of the countries involved, but of the entire world. This would be especially true if the conflict were to be long drawn out, but such a contingency does not seem probable where the belligerents are so powerful and situated in such close proximity one to another. Modern warfare is so appallingly destructive as well as expensive that there is little likelihood of its being dragged out for years, as was so frequently the case in past centuries.

The foreign commerce of European nations participating in the war is likely to be entirely paralyzed, and indeed seems to have already ceased. Since these represent the greatest maritime and commercial nations of Europe, it must also necessarily affect the European commerce of neutral nations. The electrical export trade of the United States will necessarily be affected, and probably in two ways. Exports to Europe will largely be suspended, but this should be more than made up by the opportunities for disposing of American goods in other parts of the world. Our principal competitors in electrical supplies have been Germany and England, and their trade with other parts of the world must be seriously crippled by the present conditions. There should be an opportunity then for American manufacturers to make advances in South America, in the Orient, and in other territory which has previously been supplied by English and German manufacturers. The principal electrical exports of the United States consist of generators, motors, transformers, telephones, wire and cables. But little of this material has gone to Europe or to English and German colonies, especially the latter. Interruptions to this business should consequently not be so serious as might at first seem likely. Even if England or Germany, through decisive naval victories, should be able to maintain its commerce upon the high seas, the uncertainty of delivery would be very influential in directing orders to this country.

Wireless communication will probably be but slightly interfered with, but a falling off in the volume of cable communication to Europe may be anticipated on account of the strict censorship, the cessation of business, and the probable cutting of cables.

One of the most serious effects of the war upon the electrical industry in this country is likely to be felt in the lack of capital for new enterprises. The investment of European capital in this country will undoubtedly cease and indeed has already done so. Our market has been flooded with securities which were held in Europe and upon which European bankers have been anxious to realize on account of the extreme demand which will be felt there for money to finance the various governments during their enormous expenditures for military and naval purposes. This condition represented a fine opportunity to buy such securities at bargain prices to the great advantage of the American investor, as distinguished from the speculator who would be hurt by the marked fall in prices, but the action of our principal stock exchanges in closing shop and discontinuing business will prevent any large transfer of securities.

Bank discounts have jumped in this country as well as in Europe and it is evident that money will not be easily secured for new construction work, which might otherwise have taken a fresh start as soon as Congress finishes its activities in connection with new legislation affecting business. The steady demands of operating companies for present needs and small extensions will naturally continue and there is no cause for apprehending any poorer business conditions than have already prevailed for some months past.

The precautionary measures already taken by the administration and the banking interests to prevent a condition of apprehension with respect to the financial resources of the country have had the effect of engendering some degree of optimism. Sir George Paish, a noted economist, and editor of the *Statis*, the great British financial weekly, in a recent editorial said: "The mischief and injury a great European war will cause will be greatly minimized if American bankers and investors are as courageous as English bankers and investors have been in the past. In brief a great war in Europe will give the United States an opportunity of assuming the position of world banker by supplying capital freely to countries and individuals in all parts of the world who need it and can provide the required security. Should the American people take advantage of the golden opportunity thus afforded, then the outbreak of war in Europe will mean not diminished but increased prosperity for them."

Undoubtedly, the courage and the resources are here. If exercised, the electrical industry, which has shown consistent gains even in times of severe depression, should share to a great degree in any material prosperity that will be witnessed.

In the meantime, nothing will so manifestly operate toward an ultimate balance being struck as an intelligent realization that two responsibilities are certainly upon us—on the one hand with regard to our commercial opportunities in the paralysis of foreign industry, and on the other, the conservation of our resources against the days of low prices.

ELECTRIC VEHICLE DATA.

It has been frequently stated by the manufacturers of electric vehicles that under existing conditions it is impossible for them to carry the burden of the development of electric vehicles in localities where they cannot obtain the co-operation of the central station. It would, of course, be a serious drain on the finances of such companies if they were to undertake any expensive promotion work in cities where the utility companies take a neutral or in some cases an antagonistic attitude toward the electrically propelled car, and it will be invariably found that in the vicinities where the largest number of electrics are in use the central-station companies have extended the greatest amount of co-operation.

One of the reasons advanced by the central-station interests as to their inactivity has been the lack of suitable working data with which the central-station salesmen could be equipped to properly prosecute the missionary work that is necessitated. It is true that in some localities electric-vehicle departments have been established by the central-station companies and every assistance rendered to the user. But the need has been for active educational and sales work that could supplement that of the vehicle manufacturers' representatives, among the prospects.

With this situation in view we are inaugurating in this issue the first of a series of electric-vehicle data pages, which it is believed can be used by vehicle and central-station salesmen alike in acquainting the prospective user with actual performance data on cars now in use. The important consideration with every prospective user is the total average monthly operating cost, and in these sheets this item is, of course, given the greatest consideration. Incidental information relative to the work performed by the vehicle, its specifications and general service conditions are included.

It is intended to compile data on vehicles of all sizes in service in representative industries so that those using this information in actual solicitation will be able to show prospective users exactly the service that is being obtained by others in the same line.

It seems that central stations with their corps of salesmen coming in intimate contact with the prospective users of electric vehicles in every town, are in an excellent position to act as missionaries in the development of this mode of transportation. Certainly more can be accomplished in the advancement of the use of electric vehicles through these representatives than by the same expenditure of energy through any other channel. Equipped with data, such as are presented in this issue, much interest could be created locally in favor of electric cars, and furthermore many orders would likely result that could be turned over to the manufacturers.

To make this section thoroughly representative, the co-operation of all interested parties is earnestly solicited, and suggestions for the improvement or revision of data presented will be welcomed.

HOME RULE AND STATE REGULATION.

The principal opposition to state regulation of public utilities comes from those who advocate home rule for local communities in nearly all matters, including local public utilities. If the principle of commission regulation is accepted, however, it is evident that the idea of home rule is applicable only in the case of local utilities in communities of exceptional size. In smaller communities the expense of maintaining a body of men who shall devote their time to investigation and study of utility questions would be prohibitive, and moreover such men would not have enough to do to fully occupy their abilities and energies. The local regulation of such utilities as railroads which operate in more than one community is not at all feasible. In the case of our large cities the suggestion is indeed practicable, and it would be achieved in such a case as that of the Public Service Commission for the First District of New York State, whose activities are restricted entirely to New York City, providing this body were locally appointed and paid, and given general jurisdiction over all the utilities in its territory.

Prior to the establishment of state commissions for the purpose of utility regulation, municipalities in most states already had home rule in one form or another. In some of them maximum rates were stipulated in the franchises; in others control of the rates and service was specifically vested in the municipal authorities. In most cases the latter control was never exercised and when it was, adjustment of rates was usually made without the investigation and study necessary to determine a suitable schedule. Probabilities were, consequently, that the rates would either be set so high as to be entirely acceptable to the utility or so low as to render the interference of the courts on the basis of constitutional guarantees warranted. In either case the attempted regulation was well nigh useless. Such attempts are well represented in the effort of Chicago to fix the local rates for gas. The present administration of that city was elected upon a platform which declared for a gas rate which was afterward enjoined by the court, and the city's case has at last been abandoned.

Among the elements involved in commission regulation, to which the home-rule advocates object, is the provision which is contained in the public-utility laws in a number of states for an indeterminate franchise. It is thought that this feature of the law takes away from the municipality rights which should be retained by it. A full discussion of the advantages and disadvantages of the indeterminate franchise is given in an article by the Hon. Halford Erickson, of the Wisconsin Railroad Commission, which is concluded in this issue. He answers the critics of this feature in the Wisconsin law very completely by pointing out that the rights of the municipality are no less under this law than they were previously. He shows also the economic gain in a franchise which runs indefinitely rather than for a short term. In the latter case, if it is assumed that the franchise is not to be renewed upon its expiration, it is necessary to amortize the value of the investment during the term of the franchise. While it is true that such amortization has seldom been carried out in the past, it has been because utility managers have not assumed that they would be compelled to abandon the business at the end of the franchise term. Were they to do so it would place upon the consumers a heavy and unnecessary burden. This is but one of the advantages of the indeterminate franchise. It does not prevent home rule, in the sense of municipal ownership and operation, at any time that the voters of a municipality decide that this is desirable.

REGULATION AND INCANDESCENT LAMPS.

The general advantages of good regulation of voltage are appreciated by every central-station man and most station operators make every effort to regulate the voltage as closely as possible, sometimes installing expensive apparatus to accomplish this automatically. Heavy investments in copper are frequently made with this object alone in view, and wherever good service to customers is set up as one of the ideals of the central-station company, regulation receives considerable attention.

It is of some importance in the operation of motors since with certain types speed, and consequently amount of output possible, are dependent upon the value of the line voltage. It is important for heating devices in order that the normal temperature shall be attained. It is important most of all, however, for incandescent lamps, since the candlepower and life of these vary so rapidly with the operating voltage. With varying voltage the life of a lamp is much less than it would be under the steady application of the average value of the voltage, and if voltage falls below normal, as it usually does where there is poor regulation, the efficiency of the lamp becomes very low, the flux of light generated is decreased very many times as much as the voltage, and the consumption of energy is materially reduced.

With the new gas-filled type of incandescent lamp, these effects are more marked than with the older types. The high efficiency of the gas-filled lamp depends upon the high temperature at which the filament is operated, this being much closer to the melting point of the tungsten than in vacuum lamps. The result of a slight rise in voltage is consequently much more marked and much more effective in shortening the life of the lamp. On the other hand a decrease in line voltage is much more marked in diminishing the efficiency of the energy transformation to visible radiation. The general introduction of this type of lamp will consequently lend an added importance to the close regulation of line voltage, and this subject should receive attention wherever the new type of lamp is installed.

New England Section Convention.

The sixth annual convention of the New England Section of the National Electric Light Association will be held at the New Mathewson Hotel, Narragansett Pier, R. I., September 2, 3 and 4.

At the first session on Wednesday morning there will be an address by the president, followed by papers on "The Relation of Meter Maintenance to Revenue," by G. F. Atwater, and on "Rates," by R. S. Hale.

At the session on Thursday afternoon there will be a paper by E. C. Kimball entitled "Old-House Wiring and Special Campaigns," and a report will be made by the Merchandising and Advertising Committee.

At the session on Thursday evening the report of the Committee on Recognition of Electric-Vehicle Interests in New England will be presented by W. H. Atkins.

At the final session on Friday morning the report of the Committee on Overhead Line Construction will be presented, and officers will be elected for the ensuing year.

The secretary of the Section is Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Electric Club Picnic.

The annual picnic and field day of the Electric Club of Chicago and the Chicago Jovian League will be held at Ravinia Park, Ill., on Thursday, August 20. A program of events which includes baseball, tennis, dancing, racing, swimming, bowling, etc., has been arranged and prizes amounting to several hundred dollars have been donated.

Two special trains over the Chicago & North Western Railway will be run each way, at 9:35 a. m. and 12:15 p. m. going and at 7:05 p. m. and 10:45 p. m. returning.

The joint picnic committee representing the two organizations comprises H. A. Mott, W. C. Berry, H. M. Webber, Perry Boole, George C. Richards and F. W. Harvey, Jr.

Galena Gets Contract.

The Interstate Light & Power Company, Galena, Ill., a subsidiary of the Consumers Power Company of Minnesota, has secured a 250-horsepower electric power contract for the operation of the Peni-Benton Zinc mine. A portion of the installation is now connected and in operation.

Colorado Association Convention.

The Colorado Electric Light, Power and Railway Association will hold its twelfth annual convention at Glenwood Springs, Colo., Septemper 3, 4 and 5, 1914.

New Power Station at Newark.

In connection with its proposed new generating station at Point-no-Point on the meadow, Newark, N. J., the Public Service Electric Company has awarded a contract for foundation work at a cost of about $160,000. The contract provides for foundations for a main turbine and boiler house, about 160 by 264 feet, and switchboard room. These structures will be built upon piles in order to bring the floor level 6 feet above the surface of the ground.

In the erection of this plan the company is arranging to incorporate some new features, among these being a detached switchboard house, and outside coal bunkers. The former will be about 10 by 105 feet in size, and the first of its kind in the East. The coal bunkers will be 48 by 56 feet, and have a capacity of 2,000 tons; these will be used solely for feeding the boilers and not for storage purposes. The coal will be carried from the storage piles to the bunker, and thence to the boilers, being weighed before entering the hoppers. The bunkers will be erected on the south side of the boiler house.

The boiler plant proper will be about 128 by 168 feet, and will have a boiler capacity of 10,000 horsepower. The turbine room adjoining, approximately 95 by 160 feet in area, will have accommodations for three turbogenerators of 25,000 kilowatts capacity each, two such units will comprise the initial installation. Two stacks, each 250 feet high and 15 feet in diameter will also be erected.

Westinghouse Smoker.

The Westinghouse Club of the Westinghouse Electric & Manufacturing Company on Wednesday evening, July 29, held a brilliant reception and smoker in honor of the college instructors from all sections of the country who are spending their summer vacation periods in acquiring practical experience in the East Pittsburgh plant of the company. The club house in Wilkinsburg was thronged with participants, among whom were most of the prominent electrical men of the city. The Westinghouse Club orchestra and glee clubs contributed to the entertainment a splendid musical program. The principal address was made by Charles F. Scott, professor at Yale University.

American Roentgen Ray Society to Witness Demonstration of New X-Ray Tube.

The American Roentgen Ray Society will hold its next annual meeting at the Hollenden Hotel, Cleveland, O., September 9 to 12. On September 10, Dr. Fred Dessauer, of Frankfort, Germany, will demonstrate a tube of his invention, which it is alleged produces X-rays of the same wave-length as the gamma rays of radium.

Electric Show at Northwest Convention.

The annual convention of the Northwest Electric Light & Power Association will be held at Spokane, Wash., September 8 to 11. In connection with this convention an electrical show is being arranged by M. C. Osborne, commercial manager of the Washington Water Power Company.

The Pacific Coast meeting of the American Institute of Electrical Engineers is to be held in Spokane at the same time as the Northwest Association convention. There will be one joint session between the societies.

The Northwest Association has arranged the following program of papers: "Rates and Physical Valuation," by W. W. Cotton; "A Balance of Stores System for Utility Companies," by Edward A. West; "Outdoor Type of Transformer Stations," by J. C. Martin; "Rates: A Résumé and Comparison of Rate Theories," by Stacy Hamilton; "Extension of Electric Service into Small Country Communities and Rural Districts," by M. C. Osborne and J. C. Davidson; "Wrinkles," by P. A. Bertrand; "Electric Development on the Pacific Coast," by W. E. Herring; "Electric Appliances," by W. B. Peirce; "Organization and Operation of Branch Offices and Plants," by Lewis A. McArthur; "Public-Policy Review," by F. T. Post.

The following papers will be presented at the sessions of the American Institute of Electrical Engineers: "A Distribution System for Power Purposes," by F. D. Nims; "Electrical Application in the Lumber Industry," by E. F. Whitney; "Operation of the Butte, Anaconda & Pacific 2400-Volt Direct-Current Railway," by J. B. Cox and C. A. Lemmon; "Considerations in the Control and Application of Electric Motors for Gold Dredges," by Girard B. Rosenblatt; "The Effect of Delta and Star Connections Upon Transformer Wave Forms," by Leslie F. Curtis; "Transmission Economy," by Magnus T. Crawford; "The Big Creek Development of the Pacific Light & Power Corporation," by Edward Woodbury; "Telephony," by A. H. Griswold.

Third Congress for Radioactivity.

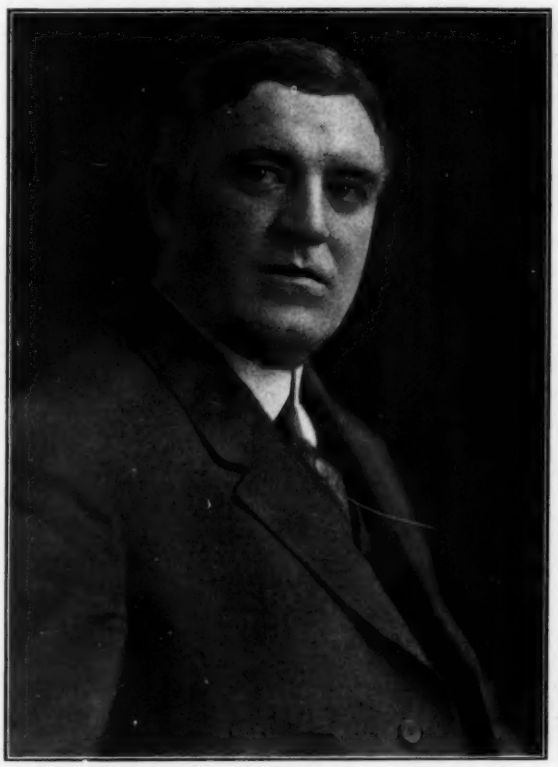
The Third International Congress for Radioactivity and Electronics will be held in Vienna, Austria, June 27 to July 2, 1915. There will be two sections; one devoted to physics and chemistry; the other to biology and medicine. Sir Ernest Rutherford, of Manchester, England, will be president of the Congress, and the general secretary is Prof. Stefan Meyer, of Vienna. E. Williams, of Boston, Mass., is a member of the Scientific Committee for Section II.

D. A. Hegarty.

The growing appreciation upon the part of the public at large of the advantages which accrue for comfort and economy in the use of electrical energy and current-consuming devices, is rapidly bringing into existence a familiarity with this service that was considered almost impossible but a few years ago. There are few people now in the city and in many towns and villages reached by central-station service that are uninitiated. Consequently, the work of the public-utility manager has become increasingly arduous as the service requirements have become more severe. In Texas particularly the people are accustomed to and demand service of a gilt-edged variety. It is fortunate, therefore, that when Col. W. H. Chapman terminated his 16 years of service as manager of the Houston Lighting & Power Company, D. A. Hegarty was available as a successor.

Mr. Hegarty is one of the best known public-utility operators in the country. He is an all-around expert in things electrical and has had a notable career as an engineer, railway man and operator of public-utility properties. He was educated at the University of Pennsylvania, entering the employ of the Pennsylvania Railroad as a rodman, and during six years' of service rising to the position of assistant engineer of construction and the maintenance of way department. Following the Johnstown flood he was engaged in reconstruction work and he was later in charge of the preliminary surveys for the tunnels through which the Pennsylvania Railway passes under the North River and the East River at New York. He also made an investigation for his company of the electrical operation of cars by the Richmond Passenger Railway.

He resigned from the Pennsylvania Railroad to become associated with A. Langstaff Johnston, pioneer electrical engineer in the railway field, in charge of the work of electrifying the railways in Philadelphia. Mr. Hegarty was engineer in charge of construction and on the completion of that work he became general manager and chief engineer of the Hestonville, Mantua & Fairmount Passenger Railway in Philadelphia. Upon the merging of the Philadelphia lines Mr. Hegarty resigned to accepted a position with the Norfolk (Va.) Railway Company. Resigning from this company he became manager of the Railways Company General, an operating and construction company having railways, electric light and gas plants in Michigan, New York and Pennsylvania. This company also made a large number of reports and carried on construction work with public-utility properties all over the United States, South America and Cuba. Resigning from this position Mr. Hegarty was associated with Ford, Bacon & Davis and became vice-president, treasurer and general manager of the Little Rock Railway & Electric Company, later on being transferred to the managership of the railway and lighting departments of the New Orleans Railway & Light Company.



D. A. Hegarty,
Manager of the Houston Lighting and Power Company.

Mr. Hegarty has been an active worker in the state and national organizations of public-utility companies. He was the organizer and first president of the Arkansas Association of Public-Utility Operators, and is a member of the National Electric Light Association, serving on the Rate Research committee; the American Society of Municipal Improvement; Engineers Club of Philadelphia; University of Pennsylvania Club; Houston Club; Chamber of Commerce; and No-Tsu-Oh Association of Houston, Tex. At the last convention of the Traffic and Transportation Association of the American Electric Railway Association at Atlantic City, he was elected president, after having served throughout the offices of second and third vice-president of this branch of the Association. Upon his resignation from the New Orleans company to devote all his time to lighting and power business and accepting the vice-presidency and general managership of the Houston Lighting & Power Company, Mr. Hegarty resigned as president of the Traffic and Transportation Association.

A man of great activity and devoting himself with almost complete absorption to his work. Mr. Hegarty has found time, however, to take the keenest interest in the development of the community in which he has been located. He is easily one of the most popular public-utility operators in the country and his genial disposition and intellectuality have won for him a host of friends and acquaintances in every department of effort with which he has been associated.

Electric Vehicle Association of America.

Albert J. Marshall, executive secretary of the Electric Vehicle Association of America, announces the formation of a New York section, to have the same standing in the Association as all other sections. Sections have also been organized at Detroit, Cleveland and Toronto, and authority has been given to the secretary to accept upon receipt a regular petition for a Buffalo section.

Strenuous efforts are being made by the New England Section to increase the membership in that division.

The membership committee reports the largest gain in membership for June, adding a total of 75 applications which, with one resignation, brings the membership up to 837.

Considerable progress has been effected with respect to the program for the fifth annual convention of the Electric Vehicle Association of America, which will be held at the Hotel Bellevue-Stratford, Philadelphia, October 19 to 21. Reports will be presented by committees on membership, formation of sections, operating records, garage and rates, insurance, papers, legislation, educational courses, standardization, traffic, good roads, central-station

co-operation, parcel post delivery, railroad development, motion-picture films, and revision of the constitution and by-laws. The section secretaries will also make complete reports. The following papers are announced:

"Progress of the Electric Vehicle," James H. McGraw.

"Unusual Application of Electric Trucks," F. Nelson Carle.

"The Motor Truck in Terminal Freight Handling," S. G. Thompson.

"Electric Vehicles in Parcels-Post Service," W. P. Kennedy.

"National Electric Light Association's Electric Salesman's Handbook, with Especial Reference to Electric Vehicle Section," T. I. Jones.

"Electric Industrial Truck" (Symposium), General Vehicle Company, C.W. Hunt Company, Automatic Transportation Company, Elwell-Parker Company.

"Educating the Public to the Field and Use of the Electric Vehicle," F. C. Henderschott.

"Electric Fire Apparatus," Chief Walker, Philadelphia Fire Department.

Power Plant at Ohio University.

An electric power plant is near completion at the Ohio University, Athens, O., for the use of that institution. It is designed to furnish electricity for light, power and various experimental purposes to the University buildings and laboratories, and was designed with this end in view by Prof. A. A. Atkinson and Prof. G. E. McLaughlin, members of the faculty. Contracts were let in November, 1913, and all work has been done and most of the material purchased under the supervision of the two professors. The total cost of the plant will be about $15,000.

Steam is furnished by four water-tube boilers, which were already in use at the University for furnishing a steam supply for heating. Exhaust steam will now be used for heating, and the boilers will supply steam primarily for power purposes. Two 120-horsepower Skinner engines will drive a direct-connected generator and exciter, furnishing 150 kilowatts of three-phase current at 2,300 volts. A Bruce-Macbeth 100-horsepower four-cylinder gas engine is also used, direct-connected to a 65-kilowatt generator, which will be used in the spring and summer, when less current will be needed and there is no need for steam for heating.

The switchboard is of the most modern type consisting of seven panels which carry indicating and recording instruments as well as the control apparatus. A special panel contains the indicating and controlling devices to be used in connection with a 25-kilowatt direct-current generator which will furnish current for experimental testing work, at 150 volts. The college already has a 40-horsepower two-cylinder gas engine which provides direct-current for the shops and the manual training department.

The distribution system is carried in underground conduits by means of lead-covered cables.

Accrington Mond Gas-Electric Plant.

Harold Gray, engineer and manager of Accrington (Eng.) electric supply undertaking, has reported upon the first year's working of his new gas plant which he describes as a radical departure in the method of electric generation in station practice in the United Kingdom, comprising the use of gas engines, the making of Mond gas, and the recovery of sulphate of ammonia. Mr. Gray says it marks a new stage in municipal supply. Generation has been done by a combination of steam-driven direct-current plant and gas-driven high-tension alternators, transformation from one system to the other being dealt with by motor-converters in the works. As far as possible the gas plant has been applied to the handling of the steady day and night load, the steam plant dealing mostly with the irregular peaks occurring throughout the running hours, and more particularly during the winter months. It has been under very excessive duty throughout the year. The producers have never had their fires out and both gas engines have been running daily, and one all night and Sundays, giving very little opportunity for methodical cleaning and overhauling. The gas plant supplied 4,099,221 kilowatt-hours to consumers, and the steam plant 1,756,809. Fuel consumption of the gas plant was 5,443 tons at an average of $3.34 per ton=0.44 cent per unit; of the steam plant, 4,309 tons at an average of $3.34 per ton and 12,259 tons of refuse at an average of 22 cents = 0.966 cent. Wages were high consequent upon the gas plant being started up in a comparatively small way. The doubling of the plant now in progress will have little effect upon the staff. This year by-product recovery has been limited to sulphate of ammonia and tar. The tar has been sold to a local refiner and has brought little profit, as it is troublesome to collect and handle. Mr. Gray says that if a plant for the manufacture of pitch were installed the process would become more profitable. During 38 weeks the yield of sulphate per ton of fuel burned was 84 pounds = $2.03. The total costs per unit were: Gas plant, 0.830 cent less 0.154 cent for profit on by-product; steam plant, 1.524 cents.

At the Accrington works there is a fully equipped chemical laboratory for use with Mond gas plant in daily use and it is found to be very beneficial.

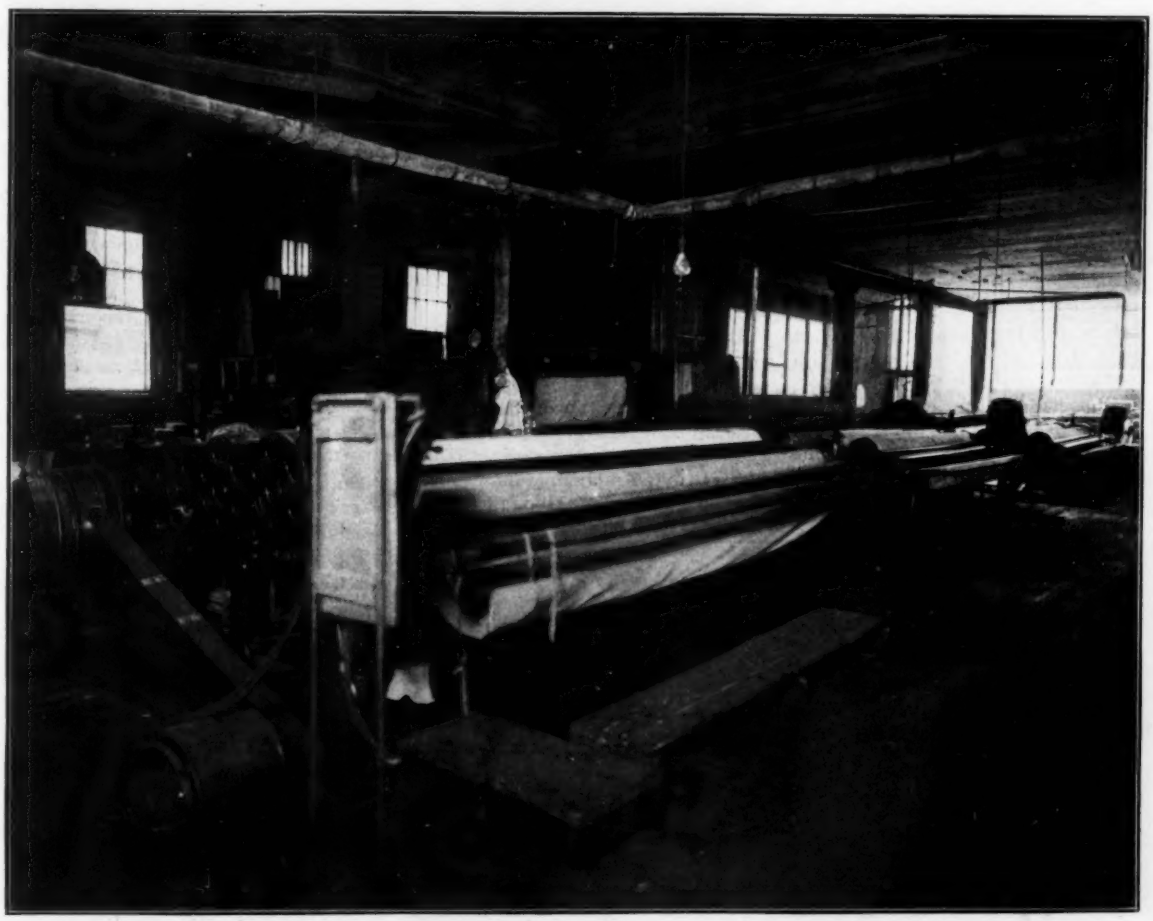
Prominent Electrical People in the European War Zone.

Considerable concern has been felt for the safety of a number of prominent electrical people who are either abroad or expected to be enroute for this country. N. F. Brady, president of the New York Edison Company, and Mrs. Brady, and Arthur Williams are known to be in London awaiting the first opportunity to return to New York. C. O. Baker, Jr., president of Baker & Company, Incorporated, the leading producers of platinum in the United States, and Mrs. Baker, are somewhere in Germany. The wife and daughter of Samuel Insull, president of the Commonwealth Edison Company, are expected to return to this country at the end of the week. W. L. Abbott, chief engineer of the Commonwealth Edison Company, Dr. J. D. McGowan, company physician, and E. W. Lloyd, manager of the contract department of the Commonwealth Edison Company, are also abroad and it is hoped that they have been able to make arrangements to return promptly. Bion J. Arnold is in Europe as a member of the Chicago Railway Terminal Commission. Hugo Eisenmenger, of the engineering department of the National Lamp Works of the General Electric Company, Cleveland, is in Vienna with Mrs. Eisenmenger. Gleason Wood, superintendent of the Waltham Watch Company, Waltham, Mass., and brother of E. E. Wood, eastern manager of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, is traveling in Central Europe accompanied by his wife; they are believed to be in Switzerland, but their exact whereabouts were unknown up to August 5. H. H. Westinghouse is in London. Guy E. Tripp, chairman of the board of directors of the Westinghouse Electric & Manufacturing Company, is in London, arriving there from the Continent with his family on August 3. Walter Cary, general sales manager of the Westinghouse Lamp Works, Bloomfield, N. J., is on the Continent, his location at this time unknown. Clarence Mackay, president of the Postal Telegraph Company, arrived in London from Paris on August 4, accompanied by his mother, Mrs. John W. Mackay, and his three children. George Gray Ward, president of the Commercial Cable Company, is in London. Gerard Swope, vice-president and sales manager of the Western Electric Company, is in London. The latter company, as well as the General Electric Company, and the Westinghouse Electric & Manufacturing Company have many Americans abroad representing them at foreign branches and offices, and concerning whom news is awaited.

Electricity in the Laundry.

It is pointed out in this article that considerable profitable business can be obtained by central-station companies from laundries, especially the large establishments which need extra power for overtime operation, sign lighting, for operation of added machines and departments, etc. Considerable business can also be obtained from the small plants, it being possible in most instances to furnish all energy required at a saving over isolated-plant costs.

Because of the fact that large quantities of steam and hot water are used in the modern laundry, it has been a difficult task for central-station companies to obtain the business of such institutions, for, in spite of the constantly decreasing price of energy it is still impossible to bring the cost to such a figure that it will compare favorably with isolated-plant costs. However, in this industry, as in so many others, the actual cost in dollars and cents should be secondary to the many superior advantages of electric motor drive with central-station service and while this does not mean that all laundries should be users of purchased power, there are many of the smaller establishments now operating isolated plants that could well afford to change over to central-station supply.



Three Mangles Each Driven by Three-Horsepower Direct-Current Motor.

In far too many cases the cost of coal for a laundry is taken as approximately the total cost for power and as the amount used will be only partially reduced by the substitution of central-station power, it is naturally thought that the latter cost would far exceed the original steam-plant costs. This condition perhaps does obtain in the large laundries and it is not the intention in this article to indicate that such business can be secured, at least at the present time. But the average small laundry, say having an aggregate load of from 5 to 50 horsepower, labors against serious wastes in boiler and engine room, incident to careless firing, leaky pipes and valves, friction losses, bearing troubles, etc., and in such cases it is to be questioned whether the coal-pile argument may not be justly relegated to a position of minor importance.

The economy of electric drive is particularly marked in those cases where the proportion of actual to connected load or total output is small. In a steam-driven plant, the general arrangement and the number of prime movers used, the distance between same and the various driven machines; the length as well as the alinement and proportion of shafting and belting; adjustment of bearings, character of the work done, etc., all affect the ratio between the average amount of energy used and the total output of driving power. It is well known that the transmission losses seldom are less

than 30 per cent, the average varying from 40 to 65, and, in certain cases being as high as 75 per cent.

The lighter the machinery to be driven, or in other words, the smaller the ratio of power required to drive a machine running idle and when doing actual work, the greater the loss in power used productively. This characteristic is particularly marked in mechanically driven laundries; in fact it has been found by test that the friction loss in such plants with all the machinery in operation is 50 per cent of the total engine power. As the amount of work on hand may decrease, or the necessities of the different departments vary, it will readily be seen that a point may be reached where this figure will be doubled.

It may be of interest, at this point, to review briefly some of the principal advantages of motor drive for laundries, for, while the use of electricity is rapidly increasing in this industry, many laundry proprietors fear to make the change because of the expense involved. A consideration of the benefits that accrue indicate that the actual expense of equipping for electric motor drive is negligible when compared with the returns. This is borne out by experiences of laundries in all parts of the country, the accompanying data sheets giving detailed motor data on four such plants.

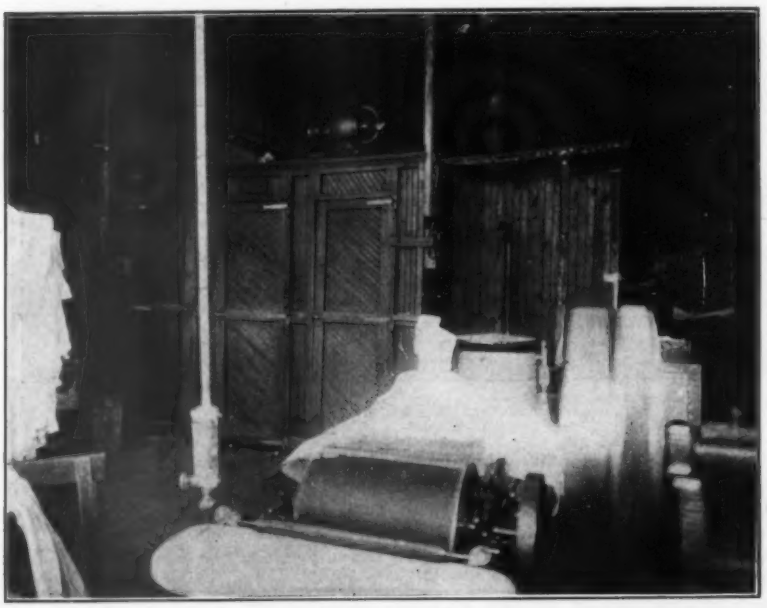
One of the principal advantages of electric drive is its cleanliness. With line shafting and belting it is impossible to entirely prevent dirt and grease from dropping on the work and in the drying, starching and ironing departments of a laundry a mishap requires the repetition of practically a whole cycle of operations, necessitating a considerable loss of time and labor, and incurring considerable expense and additional equipment.

Extractors and Washing Machines Driven By Motor.

Next in importance to cleanliness is good light, and whether artificial or natural light is depended upon it is obvious that belting and shafting must be eliminated for the best results.

There are also many other advantages such as improved working conditions because of less noise, better ventilation, etc., reduced fire risk, uniform speed of driven machines resulting in improved quality of work and greater output; elimination of breakdown troubles, etc. All of these points should be carefully analyzed by the power salesman and used to combat the arguments of greater cost of electric drive.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for January 6, 1912, there appeared an article dealing with the use of electricity in the laundry. In this article the characteristics of laundry machines and motors were fully discussed and recommendations made regarding the types of motors best suited for driving the various machines. Conditions have changed but little since the publication of this data, insofar as motor and machine design is concerned, but the following supplemental data concerning horse-



Motor Operating Dry-Room Fan.

POWER REQUIREMENTS.

Machine—	Horsepower
American Annihilator, 28x108 in. cylinder	1
American Annihilator, 48x100 in.	2
American Annihilator, Imperial 48x120 in.	2½
American Annihilator, Colossal 48x120 in.	3
Double Mammoth	1
Iron and Kreator, 100 in. wide	1
Iron and Kreator, Handkerchief, 48 in. wide	¼
Iron and Kreator, 2-roll	1½
Iron and Kreator, 3-roll	1½
Iron and Kreator, 5-roll	1½
Iron and Kreator, 6-roll	2
Iron and Kreator, 8-roll	3
48-in. Troy Steam Mangle	¼
75-in. Troy Steam Mangle	1
200-in. Imperial Troy Steam Mangle	2
110-in. Troy Wills Duplex	5
100-in. Troy Duplex	3
110-in. Troy Paragon, One Section	2
110-in. Troy Paragon, Two Section	3
110-inch Troy Paragon, Three Section	5
20-in. Extractor	1½
22-in. Extractor	1½
24-in. Extractor	1½
26-in. Extractor	2
28-in. Extractor	3
30-in. Extractor	3½
32-in. Extractor	4
Hagen Waist Band Starcher	1
Hagen Shirt Starcher	¼
Hagen Collar and Cuff Starcher	¼
Body Ironer	½
Wringers	¼
Barnes & Erb Shirt Press	½
Barnes & Erb Collar and Cuff Dampener	½
Hagen Collar and Cuff Dampener	¼
Collar Ironer	½
Dry Room Conveyor	1
Large Washer	3

Electricity in Laundries—Data Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Commercial laundry running 60 hours per week. An average of 10 tons of coal is used per month for heating and hot water. All machines are steam heated. The engineer employed when isolated plant was operated tends to furnace and assists in wash room.

Total connected horsepower, 12.5. Total number of motors installed, 4. Average kilowatt-hours per month, 1,026.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	996	May	958	September	933
February	988	June	1,067	October	1,058
March	962	July	924	November	1,113
April	1,255	August	1,010	December	1,050

Load-factor, 15.1 per cent; operating-time load-factor, 31 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is 110 volts, single-phase.

No.	Horsepower.	Speed R. P. M.	Application.
1	7.5	1,800	Belted to a 20-foot line shaft, six hangers, driving one 36 by 48-inch washing machine; one 29 by 48-inch washing machine; one 24 by 24-inch washing machine; one 38 by 30-inch washing machine; one 26-inch Watkins centrifugal extractor; one 24-inch fan used for forced draft boiler; one deep-well pump; and one boiler-feed pump.
1	2	1,800	Belted to a 12-foot line shaft, four hangers, driving one three-board bosom press; one 12-inch sleeve ironer; one 32-inch body ironer; one No. 1 collar dampener; one 14-inch Watkins collar and cuff starcher; one Bishop steam dampener; and one dry-room fan for a No. 1 Troy Laundry Machine Company sectional dry room.
1	2	1,200	Three-phase, 60-cycle, 220-volt, motor belted direct to one 26-inch Troy extractor. This motor is especially adapted for individual drive by having a regular cast-iron pedestal for the motor.
1	1	1,800	Belted to a countershaft driving one 100-inch No. 11 Hercule mangle; one 40-inch American Laundry Machinery Company collar and cuff ironer. The following electric irons are also used in this installation: five five-pound irons; two six-pound irons; and one 20-pound iron.

General laundry doing a business having an average value of $3,500 per month. There are five men and eight girls employed, working 60 hours per week. There is installed one 60-horsepower boiler for heating water; burning natural gas. The average consumption of gas per month is 1,365,000 cubic feet.

Total connected horsepower, 18. Total number of motors installed, 6. Average kilowatt-hours per month, 1,921.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,310	May	2,220	September	1,690
February	1,880	June	2,100	October	2,150
March	2,160	July	1,680	November	2,210
April	2,360	August	1,560	December	1,730

Load factor, 19.6 per cent; operating-time load-factor, 41 per cent.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horsepower.	Speed R. P. M.	Application.
1	3	1,800	Belted to a 12-foot line shaft driving two 100-shirt washers; and one 100-shirt washer.
2	2	1,200	Each direct-connected to one 28-inch American Laundry Machinery Company extractor.
1	5	1,800	Belted to a 14-foot line shaft, four hangers, and eight feet of countershafting driving the following: Five 100-shirt washers. One 150-shirt washer. One 50-shirt washer.
1	3	1,800	Belted to an eight-foot line shaft, three hangers, driving two Troy Laundry Machine Company four-roll mangles.
1	3	1,800	Belted to an 18-foot line shaft, five hangers, and seven feet of countershafting, three hangers, driving the following machines: Two American Laundry Machinery Company shirt ironers. One neck-band ironer. One Troy sleeve ironer. One body ironer. There are also installed in this plant several six-pound electric irons which are, however, attached to the 110-volt lighting circuit.

Electricity in Laundries—Data Sheet No. 2.

Commercial laundry doing an average daily business amounting to $300. There are 40 girls and six men working 60 hours per week. All steam for heating and laundry work is purchased.

Total connected horsepower, 50. Total number of motors installed, 9. Average kilowatt-hours per month, 2,687. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,550	May	2,850	September	2,870
February	2,020	June	2,920	October	2,630
March	2,720	July	3,030	November	2,500
April	2,760	August	3,520	December	2,600

Load factor, 9.8 per cent; operating-time load-factor, 20.7 per cent.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M	Application.
1	5	1,120	Belted to a 14-foot line shaft, five hangers and 16 feet of countershafting, driving one three-board bosom press; one 12-inch sleeve ironer; one 32-inch body ironer; one Troy No. 1 collar dampener; one 14-inch American collar and cuff starcher; one dry-room fan for No. 1 Troy Laundry Machine Company sectional dry room; one 100-inch mangle; one 40-inch collar and cuff ironer; one neck-band ironer; and one yoke press.
1	15	900	Belted to a 40-foot shaft, nine hangers, and five countershafts, 11 hangers, driving one 28-inch by four-foot washer; two 40-inch by 57-inch Adams washers; one 3-foot by 4-foot Adams washer; three cylindrical A. T. Hagen washers; two Troy washers; one Adams extractor; and two American extractors.
1	15	900	Belted to a 35-foot shaft, nine hangers and four countershafts, eight hangers, driving one 36-inch by 52-inch washer; one 46-inch by 48-inch washer; one 30-inch by 30-inch washer; one 26-inch Poland extractors; one 24-inch Troy extractor; one Watkins extractor; two American extractors; one Deming triplex pump, 30 gallons per minute; and one 32-inch exhaust fan, 850 revolutions per minute.
1	1	1,700	Belted to a jackshaft driving one Hagen shirt press; one air compressor 5 by 6 inches operating above press.
1	1	1,700	Belted to a 12-foot three-hanger line shaft driving one three-foot Sinclair body roll; one three-foot Barnes and Erb body roll; and one 18-inch Bishop starcher.
1	2	1,700	Belted to a 20-foot shaft driving three A. T. Hagen mangles, main roll 7.5 inches by 32 inches, 40 revolutions per minute; and one Barnes and Erb mangle, main roll 7.5 inches by 32 inches, 32 revolutions per minute.
1	5	1,120	Belted to a 40-foot line shaft driving one three-roll starcher, main roll 4 inches diameter, 66 revolutions per minute; one vertical collar ironer; one National marking machine; one Stebbins collar and cuff dampener; one Bishop shirt bosom starcher; one collar ironer, roll 2.5 inches diameter by 12 inches, 71 revolutions per minute; and one collar conveyor.
1	1	1,700	Belted to a countershaft driving a five roll, 101-inch Hagen flat-work ironer, speed 75 revolutions per minute.
1	5	1,120	Belted to an 18-foot line shaft seven-hangers, driving four shirt ironers; two neck-band ironers; two sleeve ironers; and two body ironers.

Laundry plant doing an average daily business of $150. There are 20 girls and three men employed working 60 hours per week. This installation replaces a steam installation and was secured after a trial for several months during which time the coal consumption was reduced approximately 60 per cent. The services of engineer were dispensed with and fireman takes care of 100-horsepower boiler now used.

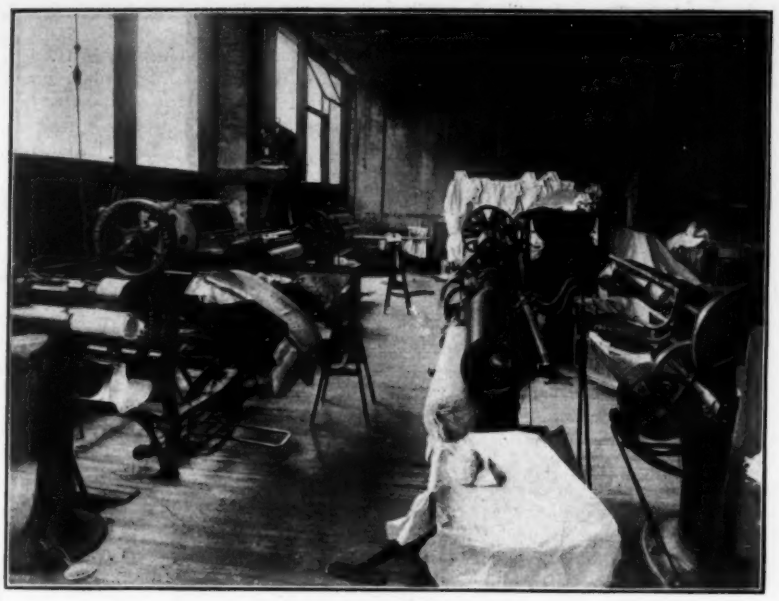
Total connected horsepower, 24. Total number of motors installed, 5. Average kilowatt-hours per month, 2824. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,630	May	2,814	September	3,081
February	2,669	June	2,974	October	2,711
March	2,716	July	3,165	November	2,424
April	2,761	August	3,227	December	2,715

Load-factor, 21 per cent; operating-time load factor, 45 per cent.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	900	Belted to a 30-foot line shaft, nine hangers and two countershafts, driving one 150-shirt washer; two 125-shirt washers; two 36-inch extractors; one 100-inch mangle; one vertical collar ironer; one body ironer; and one 24-inch dry-room fan.
1	5	1,120	Belted to a line shaft driving one body ironer; one neckband ironer; one marking machine; one bosom ironer; and one 24-inch exhaust fan.
1	0.5	1,700	Belted to a 12-foot, two-hanger line shaft driving one Heim collar-shaping machine; one Stebbins collar and cuff dampener; and one Twigg steam dampener.
1	3	1,120	Belted to a line shaft driving two 100-shirt washers; one 100-shirt washer; and one 24-inch extractor.
1	0.5	1,700	Belted through countershaft to a 14-inch diameter by 18-inch Bishop starcher, running at 90 revolutions per minute.



Ironing Room of Laundry.

power requirements may be of interest. It should be remembered, however, that it would be impossible to give this information completely and the figures presented are intended only to give approximately the sizes of the motors required.

John Richmond, formerly electrical engineer of the American Laundry Machinery Company, who has perhaps given more study to the question of central-station service for laundries than any other individual, some time ago contributed a report on this subject to the Commercial Section of the National Electric Light Association. The report may be considered by some to be prejudiced, as Mr. Richmond states that "we know of no case where a laundry is purchasing current from a central station." By this is meant that the numerous establishments purchasing power are below average size and are therefore not considered as representative laundries. In fact Mr. Richmond does not consider a plant having a load of less than 50 horsepower as a laundry and it is true that there are not more than half a dozen larger plants at present on central-station service. However, when the great number of these small plants is considered, almost all of which can profitably purchase current, it seems that there is an immense field open for additional business.

In regard to the larger laundries some of the points brought out by Mr. Richmond are particularly significant.

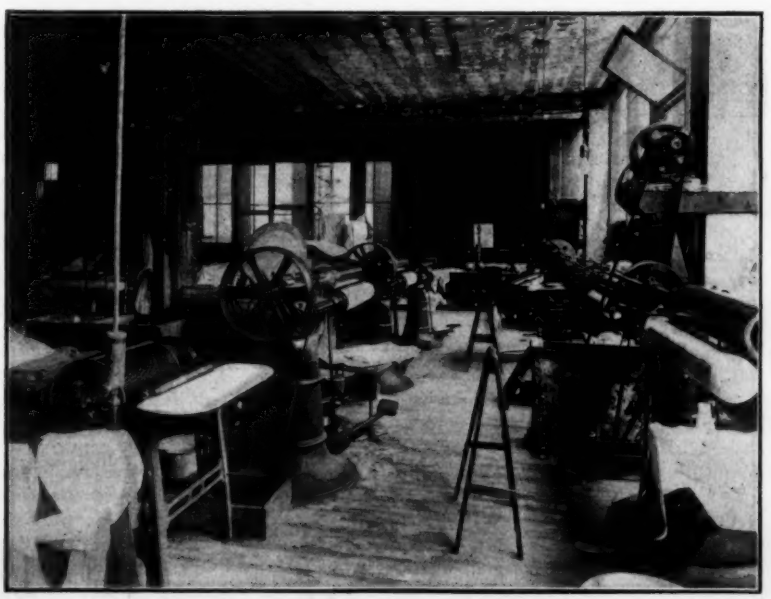
The central station is in position to render invaluable service to the laundry industry. The laundry industry, on the other hand, is not only in position but ready to be a large and grateful customer of the central station, yet no business results. After several years' experience and careful noting of the canvass made to obtain this class of business, it seems that it has never been gone after in the right way.

Misrepresentations by solicitors, due probably to misunderstanding or lack of knowledge of laundry conditions, have occasionally resulted in the purchase of current by a laundry. In no case, however, have the laundries continued to purchase current, and more than this, they have taken every opportunity subsequently, at their conventions and elsewhere to mention the folly of believing central-station solicitors.

Instances like those referred to have contributed more toward loss of laundry business than any other single factor, because in each case the parties concerned have been able to prove conclusively by comparing their costs for heat and power when purchasing current from the central stations and when generating their own, that they could not afford to buy current and generate steam. Yet an intelligent study of laundry conditions, of the personality of the average laundryman, of his progressiveness and sound business sense, proves conclusively that every laundry can be and should be a central-station customer and booster. The campaign to accomplish this result will need to be conducted along lines very different from anything heretofore followed.

The problem resolves itself briefly into the following: Is it better for central stations to sell to occasional laundries all their power, with the certainty of losing this business in course of time, or to sell to all laundries power for sign lighting not only at the plant itself but at all its branches, current for overtime work and current for operating the plant on certain days?

No laundry of average size and above can afford to operate its plant on central-station power. The matter of rate paid for this power has only a pro-rata bearing on the question, as no economy would be effected, be the rate ever so low; yet, on the other hand, a laundry cannot afford to be without central-station power for sign lighting, overtime lighting, and



Five-Horsepower Motor Driving Laundry Machines.

overtime work, if this is obtainable on some reasonable basis.

This brings us to the stumbling block, namely, the question of so-called break-down service. The larger percentage of laundries in the country ask what they shall install. To this there is but one answer and that is, find out the current furnished by the central station and, unless this be single-phase current, install an equipment to correspond. The word "break-down," although it is commonly used, should not be applied to city current furnished to a laundry which has its own generating equipment. The term break-down service misrepresents the condition to the central station in the first place, as its operating department at once raises points against installing an equipment for maximum capacity, where only a small percentage of the transformer or line capacity will be called for normally, and where there is liability to be called upon at times of peak-load.

Break-downs may, of course, occur but they are so infrequent as not to be worthy of serious consideration, and while the term may be permissible in relation to other trades it is not correct as applied to a laundry. Further than this, it is quite possible by the installation of automatic devices, to limit the amount of current taken by any such installations during times of peak-load.

We can quote you instances of many central stations which have furnished this so-called break-down service, the capacity of the installation being for maximum load, but the current taken (excepting occasionally for such work as repairing an engine, turning down a generator or other matters of that kind) has been confined to overtime lighting, overtime work, sign lighting, and so on. The amount of current purchased by these laundries has increased every month. Added lights, increased overtime work, because of the facility with which power could be obtained, and further, and more important than this, the use of central-station current exclusively on days, such as Monday and Saturday, when only part of the plant was operating, the week's work not yet collected, or nearly all delivered. Such business is very profitable.

The laundrymen's trouble, so far as operating their own plants, can be briefly defined as the necessity for having a licensed fireman. When closing time comes they have to close, as their fireman cannot run all day and also overtime. With central-station service, however, the ease of running overtime work tends to fix the habit, as it can be done for considerable overtime with the steam in the boilers and the hot water in the tanks without refiring.

Any broad-minded policy along these lines must result in an increase in the amount of central-station current sold to laundries in all towns large enough to support laundries.

Commercial Practice
Management, Rates, New Business

ELECTRIC DEVICES USED IN STORE FRONT PUBLICITY.

Suggestions for the Store Manager.

At a recent convention in Chicago of the Window Dressers' Association, A. J. Edgell, representing the Display Service Bureau of the Society for Electrical Development, Inc., presented a very interesting paper on the utilization of electrical devices in store-front publicity work, from which the accompanying pertinent suggestions are taken. The paper was illustrated by actual demonstrations of the devices described.

In the broad sense, store-front publicity means not only the show windows, but every exterior feature that draws attention to the front or even the building itself. Electricity lends itself very effectively to store-front publicity. Attractive store fronts and light are the builders of a modern business street. Light will inject new life into a street and will often overcome a bad location, as brightly lighted streets attract the public. Good illumination is the greatest aid to selling, for people are gayer, and readier to spend money when lights are bright.

Wise merchants take advantage of this fact and band together for the better illumination of the business districts.

By means of ornamental posts, with clusters of bright lights, arches of light over the streets, electric signs, outlining their buildings with lights, and effective illumination of their show windows, merchants turn these business sections into "Great Light Ways." Publicity of this kind pays big dividends in increased business. A good electric sign gives a store front an air of prosperity. People can't escape an electric sign—it forces itself on their vision and burns its message into their minds. The electric sign's efficiency is greatly increased if run on a flasher. The movement arrests the attention, as the eye is naturally attracted by anything in motion.

For lighting large areas, both interior and exterior, a new lamp has been brought out. This is the high-candlepower Mazda lamp and operates at an efficiency that is 33 per cent higher than ever before obtained in a commercial incandescent lamp for standard lighting circuits. The color of light given by these lamps is superior to that given by any other form of incandescent lamp. Because of the intense brilliancy of the filament, it is desirable that the lamps be used with some form of diffusing glassware. They are ideal for use with indirect or semi-indirect lighting fixtures. They may be used with a proper shade to throw the light into the show window. Instead of the tungsten filament burning in a vacuum as in the past, the bulb of these high-candlepower lamps is filled with nitrogen gas, greatly increasing their brilliancy and efficiency without increasing the amount of current consumed.

Another important feature of store-front publicity might be an electric clock. A merchant who includes an electric clock in his store-front publicity is doing the public a good turn and incidentally makes good advertising for himself. These clocks are in pairs: a master clock which is of ordinary size and placed in the store interior, and the secondary clock, which is the one used on the exterior. The secondary clocks range from twelve inches to fifty feet in diameter.

During the day people may not have time to give more than a passing glance; at night they have more time and inclination to observe displays, and therefore it is apparent that the more effective is the night showing the bigger is the result. But no matter how ex-

cellent window displays are, if they are not lighted properly they will not attract the attention and sell the goods they show. Brilliant lights from hidden sources will increase the selling power of the best window display. The show windows are the eyes of a business and it is important that they should be kept bright and sparkling.

In order to see a window display clearly and easily, without eye-strain, bright lights in the field of vision should be avoided, as the picture of the light source itself will be formed on the retina of the eye and other objects will appear dim in comparison. A point of light attracts the eye and so detracts from the display. Exposed lamps running around the border of the window or installed in ceiling sockets or in chandeliers, dazzle the eye and so blind the prospective purchaser that it is impossible for him to properly see the goods exhibited. A blaze and glare of light may attract attention; but a window so lighted fails as a sales producer.

A brilliantly lighted show case is as attractive an object within a store as a well-lighted window is to the outside.

It is advisable to consult a window-lighting expert when lighting systems are to be purchased. There is probably more waste in the illumination of show windows than in any other department of a store, as merchants who may display great business intelligence in other matters sometimes disregard the laws pertaining to this important matter and select systems of lighting entirely unfitted for their particular types of windows. Window illumination is a different proposition from other kinds of lighting, and all illuminating engineers are not competent to advise correctly in this matter.

For showcase lighting, special reflectors are manufactured and a special lamp is made for use instead of the ordinary lamp.

The ideal window illumination is that in which the light units are concealed and the light itself is thrown from the top and front so that no annoying shadows are made. The effect of this kind of lighting is that of a well-lighted stage: all objects in the display show clearly and there is no eye-strain.

A time switch for controlling the window lights is an excellent investment and soon pays for itself in that it can be regulated to turn the lights on at dusk and off after the theater crowds have passed, and so prevent waste of light. It has been wisely said that a time switch for controlling the lights is as far ahead of a clerk or watchman as a Mazda lamp is in advance of a tallow candle. A time switch saves the annoyance of going back to the store once or twice every evening to turn the lights on or off as is necessary.

To get an electric connection for any of the many devices that may be used, every show window should have an outlet box, eliminating the necessity of running unsightly cords from lamp sockets. These outlet boxes should be at the rear of the window. Two of these outlets are sufficient for the ordinary windows, for with two, and devices of this kind, as many connections may be had as desired.

In order for a show window to be a sales producer, it must carry a message. One very efficient manner is by means of show cards; but when it is desired to make the message especially strong, electric miniature signs should be used. Letters for these signs are interchangeable and require no special wiring.

Many novel signs may be operated and many stunts may be pulled off with the aid of electricity, and in this way a "punch" can often be put into a display.

Small motors ranging from one-thirtieth horsepower up may be used to operate various window devices. Several manufacturers make a specialty of such motors. Small flashers may be used to illuminate a sign after the window lights are out, or to wink a sign over a department.

It is no longer necessary to dip lamps in dyes to get colored effects, since color caps are to be had; they are made to fit all standard sized lamps, give a uniform color and can be had in practically any color. The advantages of these colored caps will be readily apparent to any one who has used the messy dyes for coloring purposes.

Frequently the yard-goods departments of a store have only artificial light: and electricity, as usual, comes to the aid of a customer who wishes to match colors. A color-matching device filters the light so that it has the color of daylight and permits the matching even of delicate shades. A device of this kind in the show window, and a card telling the public that they may match colors in the yard-goods department day or night, will undoubtedly help this department materially.

The simplest method of removing frost from show windows is by means of an electric fan, while in the summer a fan, in operation near the entrance to a show window, will not only circulate the air, but will prevent flies from entering.

An electric vacuum cleaner should be used in windows with carpeted floors, for instead of dust and lint rising to be breathed in by the trimmer, as is the case when a broom is used, all dust and lint are removed and the air is left clear.

An electric flatiron may be used for pressing ribbons or other materials belonging to the display department, that become mussed in the show window.

An electric flasher is of service not only for signs, but can be used for changing light effects in the show window and store interior.

An electric fountain in the show window or store interior makes a beautiful centerpiece when banked with plants. The electric fountain usually has a self-contained motor and pump, using the water over and over and requiring no outside water connections. It can be attached to the ordinary lighting circuit and when once filled will run for hours without attention. Central stations usually have devices of this kind to rent at a reasonable price if it it is considered not advisable to purchase one.

Other decorative features, such as electric flowers, etc., can also be had from central stations.

Miniature lamps can frequently be used to advantage in the show window as a decorative feature, as their brilliancy is not great enough to dazzle the eye and detract from the balance of the display. During the fall and winter months such decorative features are especially effective. Miniature lamps, when used in interior displays, twined through artificial foliage, enhance the appearance of the decorations.

Electric Cooking in Kalispell.

A cooking school recently held by one of the newspapers in Kalispell, Mont., resulted in popularizing electric ranges for cooking, an electric range having been furnished by the Northern Idaho & Montana Power Company for the demonstrations. Manager McDonald says: "We have customers for all the electric ranges we have in transit and housewives have become very much interested in electrical cooking."

Concerning three electrically operated irrigation plants installed by the ranchers on the lines of the company Manager McDonald says: "The owners are much pleased with the results secured by irrigation and are more than pleased with the electrical installations. The water has proven very beneficial and I feel that these three experimental installations will result in adding a considerable amount of this class of business to our lines."

Fulton Activity.

"Breezes all day for a nickel" is a pulling phrase used by the Public Service Company of Western Kentucky, which owns and operates the electric plant of Fulton, Ky. The company is devoting much newspaper space to its campaign for house wiring, which is moving forward successfully.

Electric Vehicle Data

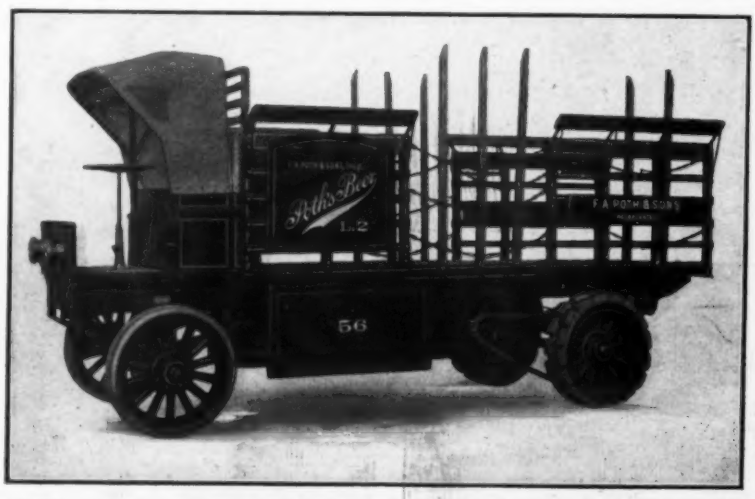
Electrical Vehicles in the Brewing Industry.

It is a pretty widely known fact that the brewing industry has made a large expenditure for electric commercial vehicles and the success with which these interests have been operating this type of machine can be taken as an indication of what may be expected from motor vehicles in other lines of business. One of the strongest boosts the electric ever received came, unsolicited, from Jean A. Blaise, superintendent of the transportation department of the Doelger Brewing Company, of New York City, at the recent convention of the Electric Vehicle Association of America. Among other things Mr. Blaise stated that 58 electric trucks were saving $80,000 a year for his company. Two men, one at $23 and one at $14 per week are required to look after the electrics. This company has disposed of its entire stable of 200 horses and in so doing twenty-eight city lots, valued at $20,000 each, or a total of $560,000, have been released, as the horse stable which was 350 by 350 has been replaced with an electric garage 85 by 100 feet, and the ground formerly occupied by the horse stable will be utilized for buildings in which beer will be bottled. The delivery of beer formerly cost this firm 35 cents per barrel, but with the electrics this has been reduced so that within the eight-mile radius the cost of delivering amounts to 15 cents per barrel. It is expected that as soon as additional trucks are installed—eight of which have been ordered—there will be a further reduction made. It is also presumed that beer will be delivered with the aid of more trucks at a cost of 12½ cents per barrel and this company expects to pay for its complete change to electrics in three years with the saving effected. After that time it can be seen that the saving will become more in the form of an earning.

Another instance of where real economy has been effected by the use of electric trucks by the brewing trade is found in the experience of the Jacob Ruppert Company, also of New York, which has 83, purchased at intervals covering about seven years. A saving of $833.33 per machine per year is now being realized by this company. Out of 120 powerful horses, valued at $1,500 and $2,000 per team, only 50 remain in service, and in the meantime business has increased constantly. The cost of delivering beer, when the company was using 120 horses was 33.7 cents per barrel. With electrics it has been 24.75 cents per barrel, a reduction of approximately nine cents on each one. Although the horse equipment hauled about the same load as the electric—11,000 pounds—the distance traveled by each kind of equipment shows a wide variation. Horses accomplish only 12 miles a day, as against a rated battery mileage of 35 for a five-ton machine and a speed of seven miles an hour, practically twice as fast as the horses were able to go.

As in the case of the Doelger company, the Ruppert interests have trained their horse drivers to operate the electrics, but this is not a new departure from the general practice, as statistics reveal the fact that ex-teamsters are now driving electric machines for various firms in all sections of the country.

These are just two of the many examples that could be cited to show the advantages of electric trucks for brewery delivery. The fact that the electric is being extensively used by brewers in many of the larger cities of the country, and is at least being introduced in most of the smaller cities, is known to most people who are at all interested in transportation. It is said that within a very few years fully two-thirds of all city trucking will be taken care of by the electric.



General.

Name of Company—F. A. Poth & Sons, Incp., Philadelphia, Pa.
Business—Brewers.
Capacity of Vehicle—5 tons.
Approximate Price—$4,400.
Make of Tires—Gibney Wireless (Solid).
Battery—Ironclad—48 cells.
Date of Purchase—1911.
Maker of Vehicle—General Vehicle Company.
Size of Tires—36x5 front; 36x 3½ dual rear.

Operating Data.

Average Daily Mileage—20.
Daily Hours in Use—8.
Kilowatt-hours per Month.
Days in Service, per Month—25.
Driver's Salary per Month—$76.00.
Cost of Repairs and Renewals for 12 Months, $650.
Battery, $450.
Tires, $200.

Total Average Monthly Operating Cost—$151.

The item of $21 per month includes all service charges and entire care of vehicle which is kept in company's garage. Charging current is supplied from the company's power plant.

Electrical Construction

ELECTRIC WIRING IN A HOSPITAL.

A Description of the Electrical Work of the Evanston Hospital.

A contagious building has recently been added to the Evanston (Ill.) hospital, the electrical installation of which together with some notes on the power plant forms the subject of this article.

Three-phase 220-volt energy for power purposes and three-phase 110-volt energy for lighting purposes are obtained from a nearby pole line. The feeders are carried into the power plant as shown in Fig. 1, the wires entering conduit after forming the usual drip loops. Condulets are employed where the service conduit enters the building, thus rendering the pulling in of the wires and their examination at any future date an easy matter.

These feeders enter the power station at the ceiling level and are carried along the ceiling to the service cabinets and switchboard, the conduit being supported from the ceiling by U-straps and strip iron.

Fig. 3 shows the switchboard and cabinet layout. The small panel is the 220-volt power service panel while the larger panel is the 110-volt lighting service panel. The feeders enter the power panel in conduit, the conduit being fastened to the cabinet by the usual lock nut and bushing. In the cabinet is mounted the three-pole service switch and link fuses. The wires from the service switch lead to a three-pole conduit oil switch. From this switch the power cables pass through the lighting cabinet and enter the upper run of conduit shown in the figure. Where these cables leave the power cabinet and where they enter the light cabinet, No. 2 condulets are fastened directly to the cabinets.

The lighting cabinet also contains a three-pole switch and link fuses. One of the three wires leaving this switch is carried directly to the switchboard in the lower run of conduit, shown in Fig. 3. The outside wires are carried in the gutter of the cabinet and through porcelain bushings to General Electric current transformers on the wooden metering board. The cables leaving these transformers pass back into the cabinet and from these into the lower run of conduit. These current transformers supply current to a polyphase watt-hour meter.

The power supply is similarly metered, the upper conduit being tapped by a Crouse-Hinds fitting, through which each of two phases leave and enter the conduit, thus connecting with the current transformers supplying the power watt-hour meter. Two G. I. maximum-demand meters are also located on this panel.

Switchboard.

The switchboard is mounted on an angle-iron frame, the lower edges of the slate panels being about a foot above the floor level. The angle-iron frame extends about a foot to the rear of the board, thus supporting three narrow slate fuse panels in the rear of the board. One of these panels is provided for each of the three rows of switches. Link fuses are employed throughout on these fuse panels.

The power panel is the left one, and at present four switches are employed, one for the X-ray apparatus, one for the clinic building, one for the contagious ward and one for the old building. The lighting panel, or the left panel, makes the same distribution, except that no lighting current is supplied from this panel to the X-ray apparatus.

The circuits from these panels are

Fig. 1.—Service Entrance.

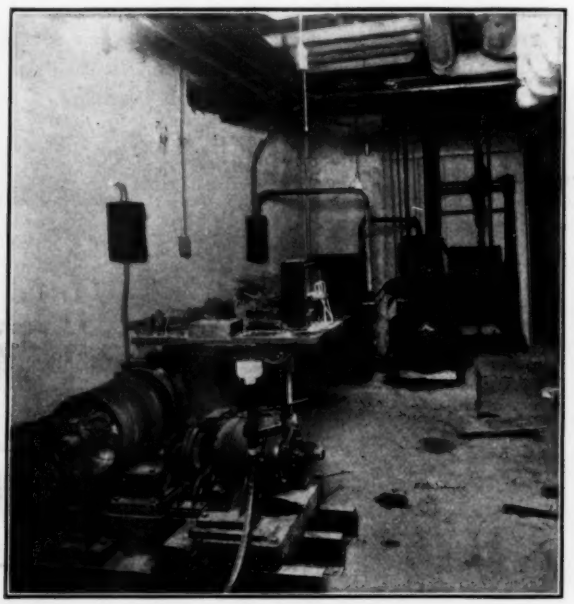


Fig. 2.—Dumb-waiter and Elevator Motors.

all run in conduit, Central Tube galvanized conduit being used throughout the installation.

In the power plant is also situated the motor-generator set, used to supply direct current to the X-ray apparatus. This set comprises a 10-horsepower, three-phase Wagner induction motor driving a 240-volt, 30-ampere Roth Brothers' motor. The motor starter and switches are mounted on a marble panel, the conduits supplying the panel and the machines being equipped with bushings at their ends.

Contagious Building.

The power, light and telephone cables leading to the contagious building are all run in a concrete tunnel of ample size to permit two men to walk abreast in it. This tunnel carries the power and light conduits for the contagious building, the conduit supplying the tunnel lights, the lead telephone cable, and other piping. The conduits are all run exposed, the conduit for tunnel lighting and the telephone cable being run on a side of the tunnel free from all other piping. U-straps are used to hold the conduit to the concrete side walls while iron straps, bent as shown in Fig. 5, are employed for supporting the telephone cable. As the telephone cable is run at a lower level than the conduit, the taps from the conduit supplying the tunnel lights, need in no case cross the cable. However, at those places that necessitate the cable crossing runs of conduit, the cable is inserted in circular loom.

A sump pump for pumping sewerage to the sewer level is located in the basement of the contagious building near the mouth of the tunnel, as shown in one of the illustrations. A similar pump is located in the power plant. The method of supplying current to the pump in the illustration is well shown. The conduit is carried down the side wall and over the top of the well to the switch box, which is mounted on a pipe through which a rod operating a switch in the rear of the main switch from a float is located.

This illustration also gives a view of the tunnel, of a telephone cabinet and a lighting cabinet. On the side of the tunnel shown in this illustration are located the main light and power conduits. Pipe racks are used to support the heating pipes in this tunnel. The conduits are hung from these pipes by means of strap iron.

In the private rooms, wards and corridors of the contagious hospital porcelain and white-enameled fittings are employed throughout, permitting of ready cleaning and disinfecting.

Nurses' Call System.

A nurses' call system is employed on the three upper floors of the contagious building. Each floor is divided into three sections for this purpose and a bank of signal lamps with colored lens is located on each floor at the nurses' station. These signal-lamp banks serve as annunciators and each bank contains nine lamps, one being provided for each section of each of the three floors. When a call is received at one of these stations, the section from which it came is immediately indicated by the lighting of the proper signal lamp on the several annunciators. Going to that section a nurse can locate the room from which the call came by the burning of a signal lamp over the door. In the case of a ward, the ward forms one of the three sections of the floor on which it is located, and a signal lamp burning over a bed locates the source of the call.

Fig. 6 shows the general scheme of connections for one section of a floor, the section containing private rooms for one or more persons. Two door lamps are shown, each being controlled in a different manner. Method 1 is the scheme employed in connection with the usual single-bed room. A three-way pendent switch is provided in the room and a three-way wall switch outside of the room's door. The second method shows the scheme of connections for a room containing two or more beds. In this case two three-way pendant switches are provided for the beds and a four-way wall switch is located outside of the door to the room. The object of having switches inside and outside of the rooms, is to eliminate the necessity for a nurse touching the signal button in the room in order to extinguish the signal when she answers a call. This feature is especially valuable as it saves time on the nurse's part, for a nurse is required to spend several minutes to sterilize her hands if she touches anything in the room. This feature is hence valuable when a patient desires a glass of water or a similar small service that does not necessitate the touching of anything in the room.

Reference to the diagram will show that operating the three-way switch for a private room (Method 1), will cause the lamp *L* over the door to light. Current flowing through the main *S* will cause the magnet *M* to attract its armature *C*, thereby closing the circuit for the relay lamp and the proper lamp on each annunciator on the second, third and fourth floors. At the same time the extension circuits on the fourth floor from which the signal is supposed to be given will be closed, causing the lamps in the service rooms and diet kitchen to light. The call is hence indicated at the places mentioned. The nurse thus knowing the section from which the call was given will go to that section and by the door signal lamp locate

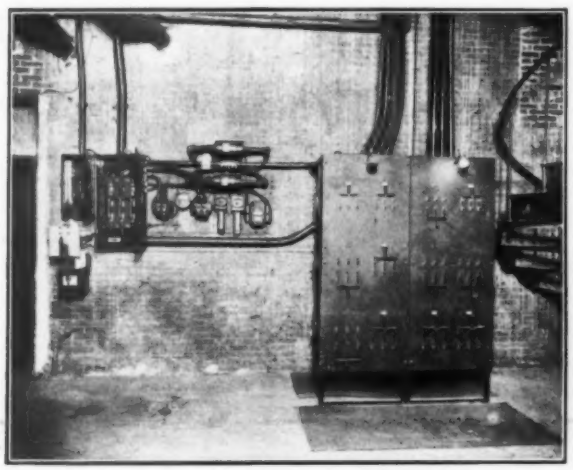


Fig. 3.—Metering Board and Switchboard.

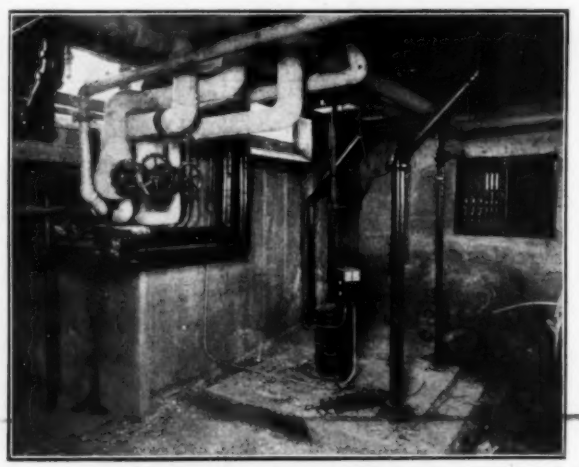


Fig. 4.—Sump Pump in Contagious Building.

the room. The three-way switch outside the door permits her to put out the signal before entering the room. If a small service requiring the touching of nothing in the room is desired, she thus is not forced to sterilize her hands. If, however, the call is an urgent one she can immediately summon aid by pressing the patient's signal button as her duties in such a case would ordinarily require touching the person or objects in the room.

The same principle of operation applies for the various modifications of the system. In the other section of the diagram three points of control are provided as indicated in the figure. As four-way switches are not generally made in the pendant type, but are made in the wall type, the four-way switch is located outside the door so as to permit two pendant switches to be located in the room. This method hence, gives two points of signal control in the room. If another pendant switch is required, one may be connected in parallel to one of the two three-way pendant switches previously mentioned, the connections being made at the wall receptacle for the plug of the pendant switch. In this case, however, the nurse will have to touch one of the pendant switches in order to turn out the lights after a call has been received.

As three-way pendant switches are employed, three-way plugs and receptacles are required in order to effect the desired connections, being the conductors in the lamp cords and the signal mains. In order to prevent a plug being inserted into its terminal in such a manner as to give wrong connections, the lugs on the plugs and the holes for their reception in the receptacles are so arranged that it is mechanically impossible for one desiring to signal to effect improper connections.

In the six-bed wards the relay is placed over the door with extensions to the nurses' station, to the service rooms, and the diet kitchen and the corresponding signal lamps on the other floors. Over each bed there is a small blue light, indicating from which bed a call is sent. Outside each of the doors to the wards the three-way switches are in gang so that the nurse can extinguish each call as for single rooms. Method 1 serves to illustrate the connections. The relay lamp replaces the door lamp as the relay is mounted over the ward door. What is labeled the door lamp in the figure becomes a bed lamp in this scheme. The two switches remain unchanged. Hence, six circuits, such as shown for a private room, but with the relay over the door, and what would be the door lamps for six private rooms over the beds, represents the connections for a six-bed ward. Any signal lamp in a ward may hence be turned off from the proper wall switch outside of the door.

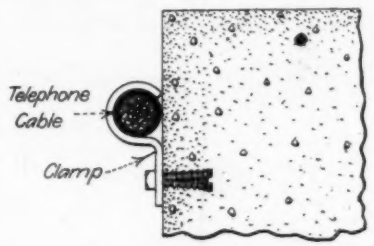


Fig. 5.—Cable Support.

An elaborate inter-communicating telephone system, an automatic dumbwaiter and an automatic elevator are also installed.

Meyer J. Sturm, Chicago, Ill., was the architect, while L. H. Lamont & Company, of the same city, was the electrical contractor. The panelboards were furnished by the J. Lang Electric Company, and the nurses' signal system by the Relay Signal Company.

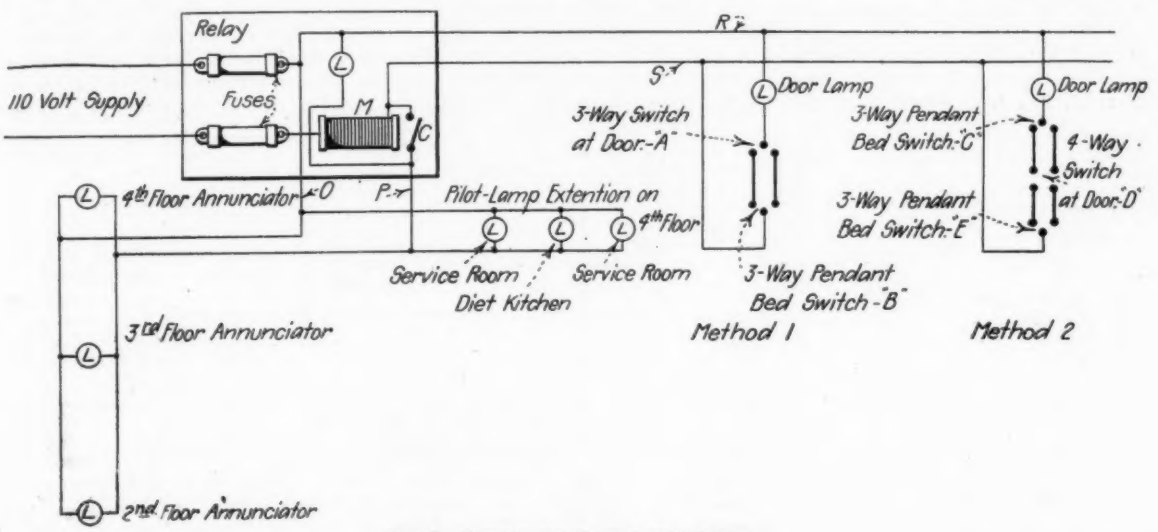


Fig. 6.—Circuits for Nurses' Call System.

Salt Lake City Contractors Have Successful Luncheons.

"If you would know a man, eat breakfast with him," says the old adage, "If it is not convenient to eat breakfast with him do the next best, eat luncheon with him," so believe the electrical contractors of Salt Lake City, Utah. In order to become better acquainted socially and consequently to promote a freer and closer business relationship, the electrical contractors of Salt Lake City for the past several months have been eating their luncheons together three times a week at the Commercial Club. They convene promptly at 12 o'clock and close promptly at 1:00.

If matters affecting the electrical industry require attention, they are discussed. Recently the Commission of Salt Lake City proposed a revision of the present electric sign ordinance.

After discussion it was found that while in the main this sign ordinance was a decided improvement over the old one, there were certain features which would work to the disadvantage of sign users, and consequently to the electrical industry. A committee was appointed, therefore, to wait on the city commission and explain the situation with the view of having the necessary remedy made. When no business items require attention the luncheon hour is given over to social intercourse, story telling, and discussion of current news. Where two men call each other by their first names it is not likely that they will get into any serious difficulty.

Wiring in Old Houses.

When installing electrical wiring in old houses, neat and substantial work is a good advertisement for both the electrical contractor and the central station. The house owner generally considers wiring an already constructed house, which may be nicely finished, as a difficult matter and liable to cause injury or defacement to wood work and floors that will be ugly ever afterward or until repaired. That such is a mistaken idea has been proven in many cases where electrical contractors have made a study of the problem and endeavor to install a neat job. This fact alone has been responsible for permission to wire houses that otherwise could not have been approached, says G. N. Mathis in an article appearing in the July number of *Electrical Engineering*. In what follows Mr. Mathis takes up a few considerations that should be of interest to an electrical contractor working on old houses.

The manner in which a conductor can be fished from a ceiling space into a partition space without cutting a large pocket is shown in Figs. 1 and 2. It is necessary with this method to bore only a couple of holes into the wall of the room near the ceiling, but these need not be larger than one inch in diameter, and they can readily be plastered up and papered over, if wall paper of the proper pattern is available. After the work has been done properly, it is practically impossible for a person standing on the floor to detect where the holes were bored. The first hole is bored as indicated at *A*, Fig. 1, diagonally from the room up into the ceiling space. Another hole, shown at *B*, Fig 1, is then bored so that it will go through the lower edge of the ceiling plate. By proper fishing, the loom-covered conductor or flexible cable can be drawn into the wire-way, provided as just described, so that it will assume the position shown in Fig. 2.

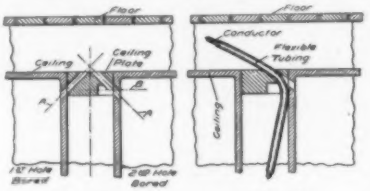


Fig. 1. Fig. 2.

In wiring old buildings of frame construction, a great deal of loom-covered conductor must be used; and, to satisfy the underwriters' requirements, this conductor must be continuous from support to support, from outlet to outlet, which precludes the making of joints or splices in partitions or ceiling spaces. When steel-armored conduit is used, it is continuous from outlet box to outlet box, and taps can be made in the wall boxes for bracket outlets. In order to meet the underwriters' requirements, where a circular-loom-covered conductor installation is being made, it is often necessary to wire for a bracket outlet, as shown in Fig. 3. A separate tap must be brought down from the support in the ceiling space above to the outlet, even though a conductor, which ordinarily might be utilized, drops down through the partition to the floor below. This feature of old-building wiring is important and is frequently overlooked until the wiring inspector investigates, when he may require a rearrangement of the conductors so that the work will meet the requirements of the Code.

A good method of supporting a wall-switch box is shown in Fig. 4. After the outlet hole is cut in the wall, the wooden switch block, which is a commercial article, is supported against the wall surface with flat-head wood screws. Frequently the support provided by screws merely turned into the laths imbedded in the wall is not sufficiently substantial. In such a case wooden cleats can be introduced into the space within the partition, as shown in Fig. 4, and the wood screws can be driven through them. This arrangement will be found entirely satisfactory. The wall switch box, after the conduit is made up into it, is then inserted into the hole in the switch block and secured to the block by flat-head wood screws, which pass through the lugs provided on the box.

Another method of supporting a wall outlet box which can be used for switch boxes, but which has been most frequently utilized for bracket boxes, is detailed in Fig. 5. The hole in the wall surface should be cut just exactly the right diameter to admit the box. A crowfoot should then be fastened against the laths on the opposite side of the partition, so that its center will coincide exactly with the center of the outlet hole. Prior to fastening the crowfoot, there should be screwed into it a nipple of such a length that about one-fourth inch will extend through the bottom of the outlet box when it is in place. A locknut is run onto the nipple, and the conduit is made up into the box and the box pushed into its position in the outlet hole and over the nipple. An insulating joint, which is necessary for supporting the fixture, is turned on the portion of the nipple that extends through the bottom of the box. A very solid support will be thus provided for the bracket if the outlet hole has been carefully cut through. If the outlet hole is too large, the support will not be solid, because a good portion of the rigidity that should obtain is provided by the box bearing against the sides of the outlet hole.

Where a bracket is to be supported in an installation where loom-covered conductors are being used, the method suggested in Fig. 6 is probably as good as any. A round wooden block is secured over the outlet hole, to the side wall, with long, flat-head wood screws, which should pass entirely through the plaster into the lath. If the support provided by screws turning into the lath is not sufficiently rigid, cleats may be arranged in accordance with the method outlined in connection with Fig. 4. The crowfoot supporting the bracket is held with wood screws to the block. The sectional drawing of Fig. 6 indicates the position the bracket canopy should assume after the installation has been completed.

Where electroliers are to be installed in connection with a circular-loom wiring job, cleats should be provided over every electrolier outlet, as indicated in Fig. 7. The crowfoot supporting the electrolier should be fastened to the ceil-

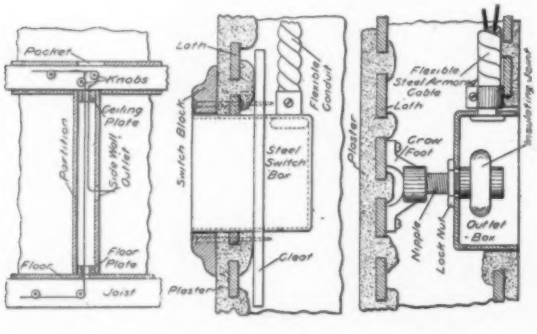
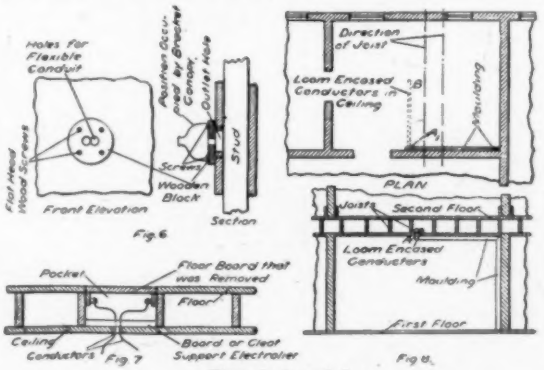
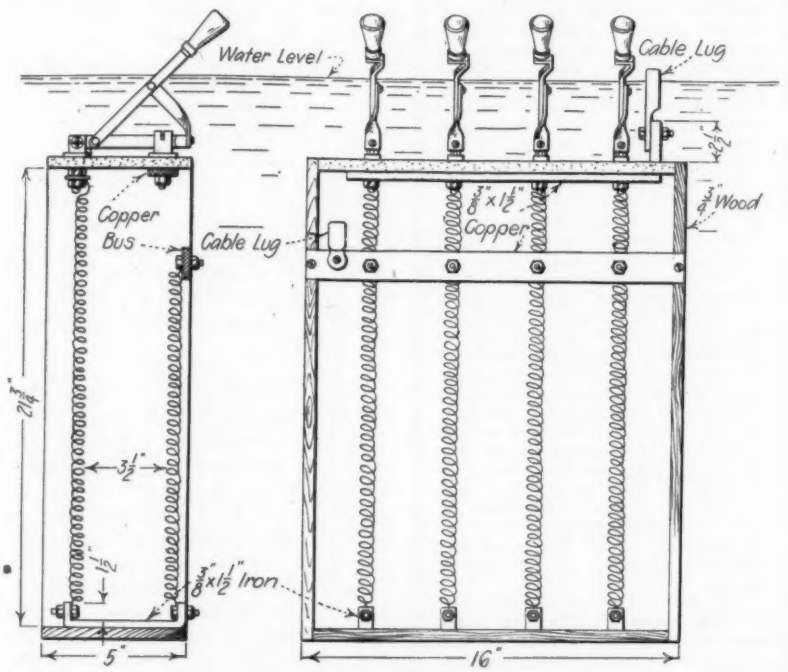


Fig. 3. Fig. 4. Fig. 5.



Figs. 6, 7 and 8.

ing with long, flat-head wood screws, which should pass entirely through the plaster and into the cleat provided for their reception. Crowfeet have a tendency to dig into the plaster when they are clamped to a ceiling with screws. One way to prevent this is to fasten at proper locations sheet-metal discs, having holes for the circular loom and for the screws drilled in them. The discs should be of such a diameter that they will readily fit within the electrolier canopies. The areas of the plates should be sufficient, that the pressure due to the screws holding the crowfeet will be distributed over a considerable surface. A substantial attachment will thus be effected and the electrolier will hang plumb. Fig. 8 shows a typical molding installation for an electrolier.



Water-Cooled Rheostat.

Water-Cooled Rheostat.

The company with which I am connected has tried a number of different resistance boxes and devices all supposed to be placed in barrels or troughs containing water for cooling purposes. However, only one box which combines large capacity, minimum amount of required space and safety to operator has been adopted as standard for generator testing.

The usual destructive arcing that occurs when a resistance coil is cut out from the circuit is eliminated in this device by placing the switch blades and jaws in water so that when the switch is pulled the arc will be broken under water.

The box illustrated will adequately take care of 300 amperes at 250 volts and with a good flow of water one can increase its capacity to 400 to 500 amperes for a considerable period of time. Each box is designed to fit in an ordinary 60-gallon barrel or, in some cases, a number of them are designed to be placed in a large trough in order to obtain a large capacity.

One of the greatest advantages of this resistance box is that one or more boxes can be wrapped up and carried in a parcel to the place where a test is to be made. The barrels can generally be picked up on the job or supplied by some dealer nearby. The head of them only has to be knocked out and a 1.5-inch-diameter hole bored four or five inches above the top board of the box.

H. W. Parsons.

Lighting a Stone Yard.

A portable lighting system has been installed by the Scioto Stone Company, Columbus, O., after original plans made by an engineer of the concern. The company's plant covers 20 acres, and night shifts as well as day are employed in the work of blasting, crushing and loading. As a measure of economy in securing plenty of light wherever it was needed, 60-watt Mazda lamps were mounted on wooden towers 12 feet high. These can be carried and placed in any desired position, by two men. Extension wires connected with the generator are fed out as required up to a distance of one-third mile. The entire system, including a number of permanent lights about the machinery, requires only 50 lamps. But for the portable feature a much larger equipment would have been required, and at a heavier cost of maintenance, than is now the case. The new lighting system has just been completed by the Avery-Loeb Electric Company, of Columbus.

Among the Contractors.

A contract has been given by the F. O. Schoedinger Company, Columbus, O., to the Sacket Mine Supply, of that city, for transforming its power equipment from gasoline to electricity. Sixteen motors will be installed, at cost of about $2,000.

F. Kind and W. Handel, recently of Shanghai, China, have just established themselves in business at 810 Franklin Street, Oakland, Cal., where they will carry on all lines of electrical construction and repairing, making signs and electrical advertising a specialty. A full line of electrical supplies will be carried, and with a finely arranged store and a good window display, the firm is prepared to serve well its patrons. The name of the firm is the Velios Electric Company.

Rice Electric Company, of Lansing, Mich., recently sold out its business to L. J. Birney who will carry a full line of supplies and conduct a general electrical contracting business at 119 Wehoir Street.

The Kingsbury-Samuel Electric Company, Baltimore, Md., have been awarded the contract for the electric light and power wiring, nurses' call system and fire alarms in the Mendels Hospital of Baltimore, Md., at their price of $2,225. This system calls for Krantz panels and Holtzer-Cabot nurses' call system and fire alarms.

The Domer-Walters Co., of Canton, O., secured the light and power wiring contract for the Gibbs Street school building at their bid of $883. They were also awarded the telephone wiring at $696.

The Barden Electric Machinery Company, 111 Main Street, Houston, Tex., announces that it has given up its contracting department and is engaged in wholesaling electrical supplies and machinery, doing a jobbing business exclusively.

The Adams Electric Company, of Youngstown, O., has received the wiring contracts covering three new terraces to be built by Amos Melinger, of that city. The same concern has the contract for the installation of the electric lighting fixtures, with wiring, in the new Girard Theater.

The production of coal in Virginia in 1913 was 8,828,068 short tons, valued at $8,952,653.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Avenue, Hartford, Conn.
H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, 11 Wareham Street, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.
C. W. Mitchell, John W. Carrell, California.

MEMBERS AT LARGE:
George L. Collison, James B. McCarthy, Frank R. Daniel, Thomas D. MacColl, James H. Fenton, A. A. Moffitt, F. G. Hartwell, R. P. Strong, J. E. Latta

"LET THE CODE DECIDE."

Necessity for Separate Service Switches and Cutouts for Separate Buildings.

Question 268. A small garage for private use is situated to the rear of the owner's residence on same lot and is fed by a circuit which is run from the house, the supply for the whole system coming from public wires in the street. Should service switch and cutout be placed in the garage, or is protection in the house sufficient?

Answer 1 (O). The present Code rules undoubtedly require separate cutouts and switches for each separate building. Personally I think that such a requirement is not necessary in a a great many instances where small outbuildings are located on same premises and used by same occupants, but there can be no mistake as to Code requirements on this point.

Answer 2 (D). Separate cutout and switch would not be required unless the circuit to which the garage or stable lines are attached exceeds 660 watts, in which case proper fuse protection would be required.

Answer 3 (Y). Would require that separate cutout be placed in the residence, and would not insist on cutout being placed in the garage.

Answer 4 (B). A separate fuse and cutout should be installed in the stable or garage referred to in question. This of course, pertains to cases where source of supply is not obtained from a private plant on the premises.

Answer 5 (P). Where a private garage requiring only a few lights is located on the same lot with the owner's residence it would seem unreasonable to require a service switch and cutout for the garage. The Code seems to recognize this condition along with others by providing for a departure from the service requirement by special permission in writing.

Answer 6 (S). In this question the residence becomes a private plant and I would not require an entrance switch and fuses in the garage or in a stable. For the convenience of firemen I always suggest a switch in any building so connected to a residence.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Answer 7 (Q). Do not think it is the intent of the Code to make any distinction between private and public service, and the problem is so treated in this territory.

Answer 8 (H). I do not think a service switch or cutout should be required in the garage, provided the circuit in question is properly protected and carries not more than 660 watts; though it is good practice to install a separate cutout for each line running from one building to another.

Answer 9 (E). If the circuit in the garage is within the 660-watt limitation and the circuit is properly protected in the residence, I do not understand that a cutout is required in the garage. Taking a reasonable interpretation of the Code I am inclined to form the opinion that the garage or stable comes under the requirements which apply to private plants, the circuit being properly protected in another building.

Answer 10 (F). If garage is properly protected by fuses in the residence cabinet the Code does not require additional fuses and cutout in the garage. As a matter of good practice, however, and to avoid annoying the residence, cutout and fuses placed in the garage are desirable.

Answer 11 (A). Where a garage or stable is connected from the house I think it is important to have a fuse where the line leaves the house and a switch and cutout in the garage or stable. Whether underground or overhead the trouble might occur between the house and garage with nothing to protect the line in the house. The switch should be placed in the garage to control the lights in that place, located not less than four feet above the floor.

Answer 12 (U). They are not necessary; I do not consider a circuit run from a house to a garage or stable as a "service."

Answer 13(R). No. Wires which are protected by a cutout in the house are not service wires and are better defined as line wires under Rule 12. The purpose of Rule 23*a* is to have as little wire within the building as possible unprotected by cutouts, and to have the cutouts in places which will permit of easy access. To have no unprotected wire within the building is ideal. In the case of private plants this is easily possible and is accomplished. In general the only cutout protection to line wires is in the individual leads of generators or transformers as the case may be; generators

may be in multiple and transformers are often banked.

Answer 14 (M). While Rule 23*a* could be interpreted so as to allow such an installation without a cutout in the garage or stable, I should endeavor to have this cutout installed.

Answer 15 (N). As I understand it the decision in this case may be considered to turn upon Rule 23*a*, first and fourth paragraphs, and Rule 24*a*, first and third paragraphs. The following questions arise: (1) Are these wires service wires; (2) If so, does the last clause of paragraph (1) in these two rules mean we can entirely avoid the requirements, or only the accessibility requirements; or (3) May these wires be considered as yard wires under the last paragraphs of Section *a* of the two rules?

In reply to the first of these questions, it is obvious from a careful reading of the entire sections that the intent of the Code is that a line, carrying power into a building, shall be considered a service except in certain specified cases. In reply to the second question, some inspectors seem to feel that the last sentence of the first paragraph of the two rules authorizes a complete suspension of the requirements if deemed advisable, and such inspectors need look no further for justification of their exemption of the requirement in this case if they choose to allow it. Others, of whom I am one, feel that this departure clause refers only to the accessibility provisions in the rules, and must accordingly look further. This brings us to the third question under which we immediately find ourselves confronted by the words "in risks having private plants." The question immediately assumes the form, "can this case be considered as falling within the specified category?"

We must ask then what electrically differentiates the public and private plant, for of course it is not a question of ownership, franchise, etc., under the Code. It might be the available energy of the plant, some question as to the power which might be concentrated upon the line in question under certain conditions. It might be local control of the prime movers. But suppose one found a mill property surrounded by a high fence or wall and inside and close to this, a substation, so that over the wall and into the station came high-tension wires with full high-tension protection and out of the station ran the low-tension or direct-current circuits, the entire system in the yard being dead and free from danger upon the opening, automatically, or otherwise, of high-tension oil switches, practically as effectively and more rapidly than if one shut down engines or water turbines. I should be much surprised if this was not regarded as "a risk having a private plant," though I suppose legally it might turn upon where the power was bought and paid for. That is, I have always felt that the criterion was the wires running over private property, the power on the line absolutely under the owner's control, and no possibility of the wires becoming entangled or crossed with lines of a different type belonging to the same company or with lines of an entirely different system.

Looking at matters in this way I have always ruled that where a service ran to a residence properly protected with service switch and cutout, and from some point in the residence a subfeed was carried to an outbuilding, such as a garage, stable or workshop, the line running entirely over land of the same ownership and free from possibility of crossing with other or foreign wires, the case was fairly one to be considered as falling under the special case.

I might refer to two other considerations which lead me to think this is the correct criterion. Suppose a mill property owns a water-power plant five miles away from its main plant, or that a steam-driven plant has consolidated with a larger water-driven one at some distance, and that in either case the plant transmits its electrical power entirely from one point to the other. Or, on the other hand, suppose the mill property takes half its power from a small plant of its own and the other half from a public-service company, or that it simply holds its own older, less economical plant in reserve, or operates it and has a breakdown connection to help out in case of need. In all these cases the case is unquestionably and strictly, under the Code, in the class "risks having private plants" and yet the possibility of danger from foreign lines would surely justify much difference in protective requirements than where the condition was simply a 220-110-volt direct-current system entirely within the yard walls.

Thus I should unhesitatingly say that neither switch nor cutout is required on the line where it enters the outbuilding, provided it is fitted with suitable fuses where it leaves the center in the residence. This is regardless of the 660-watt condition. I should allow nothing less than No. 10 wire on the span anyway, and might require larger wire according to conditions. The fuse in the residence would be a 10-ampere one, if not over 660 watts was connected in the outbuilding, and in other cases the fuse would be suited to the span wire, in which cases tap-circuit fuses would necessarily be used in the outbuilding as required.

Now from an engineering point of view, however, I should strongly urge a cutout in the outbuilding of somewhat less size than in the house simply for reasons of convenience and flexibility, and a double-pole switch because I prefer to open a line with a switch when replacing fuses when possible.

Size of Main Feeders for Varying Load.

Question 269. Where an installation has a varying load, like a theater for example, should the size of the main feeders be sufficient for the maximum current?

Answer 1(O). The size of the main wires is a question of engineering and is not determined by the Code. This does require, however, that whatever wire is used shall be protected by the proper fuses, and it would be very poor judgment indeed to put in mains which could not safely carry the maximum current which might be demanded at any time.

Answer 2(D). The main feeder should be figured to secure the maximum load.

Answer 3(Y). This is not a Code matter.

Answer 4(B). By main feeders we presume reference is made to the interior installation of buildings referred to. If such is the case the main feeders should be of proper capacity for maximum current demand.

Answer 5(P). Theaters of all places should have the copper throughout calculated for the total possible load.

Answer 6(S). Yes.

Answer 7(Q). Where installations for a varying load are in question, 60 per cent of the maximum is safe.

Answer 8(H). Yes, one cannot tell at what moment the maximum load will be used, and it is necessary to be ready at all times for the peak of the load.

Answer 9(E). Regardless of the character of the installation all wires, both main and circuit, should be large enough for the intended maximum load. The requirements of Rule 18 should never be lost sight of, especially in a theater where great liberties are taken with the wiring.

Answer 10(F). The size of the

mains should always be sufficient to carry the full load, as it could not be considered good nor safe practice to suppose that only certain quantities of an installation would be in use at any one time in a theater. Surely many times every light throughout the building is burning, as for instance, during the drop of the curtain between acts when the scene is struck. Every light on the stage is burning, that is, the white lights and the exit lights; every light in the dressing rooms, auditorium, lobbies, halls, corridors, smoking rooms, etc., is burning. The mains should surely be large enough for the full connected load at time of installation and it is good practice to allow a margin for increase.

Answer 11(A). I should think this would be required in a theater if anywhere, as full load might be called for at any moment.

Answer 12(U). If the main feeders are properly fused I do not see why they should not have to be of sufficient size to carry full load.

Answer 13 (R). They should be, but the only rule touching it is Rule 23*e*.

Answer 14(M). Yes, if the maximum current is carried. The fuses must be proportioned according to Rule 23*e* and the table of Rule 18.

Answer 15(N). This is entirely an engineering matter. The Code has nothing whatever to say upon the subject. It might well be made a requirement by the proper authorities that the wiring be planned for the maximum possible current and the licensing of the house made contingent upon this. But I do not know where this is done and all an electrical inspector can do under the Code is to see that the fusing is correct under Rules 23*e* and 18.

The reason for requiring the wiring in a theater to be planned for the maximum possible current would, of course, be the avoidance of risk of losing light under possible contingencies, though I suspect the double-service requirement for emergency lights is, in part, provided for this precise condition of proportionment of copper in the main wiring and to reduce the cost of wiring. As a general rule the ratio of copper to connected load is to be determined by experience, a careful study of the load-factors of buildings of similar occupancy, and other factors which are well known to the profession.

As a general principle the installation of copper proportioned to the highest possible peak load would lead to utterly unwarranted waste of money and space, although as the size of the installation decreases and the diversity factor of the load connected becomes less, the importance of such proportioning becomes greater.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

Annual Report. The first annual report of the Corporation Commission has been issued, for the year ending December 1, 1913. Laws affecting the jurisdiction and work of the Commission are given, together with the Commission's rules of practice and procedure. The report deals largely with the regulation of common carriers. Uniform classification of accounts is given for electric, gas and water corporations.

CALIFORNIA.

A constitutional referendum will be held at the fall election to determine the question of extending the jurisdiction of the Commission to cover all cities. The original law provided that public utilities in cities came under state regulation only when the cities voted to place them under the Commission's jurisdiction.

DISTRICT OF COLUMBIA.

Annual Report. The Public Utilities Commission of the District of Columbia has issued its first report covering the ten months ending December 31, 1913. The report contains an account of the organization and work of the various departments of the Commission, a tabulation of the informal cases, concise abstracts of formal cases and opinions of the general counsel. Information regarding the outstanding stocks and bonds of the companies is included and a compilation of statistics from the annual reports by the public utilities under the jurisdiction of the Commission.

INDIANA.

Unnecessary Duplication. The Commission held a conference with representatives of the Indianapolis Light and Heat Company and the Merchants Heat and Light Company to determine ways and means of preventing further duplication of equipment in furnishing electric service in Indianapolis. The Commission favors a merger of the two properties but, if such action cannot be agreed upon, urges that the competing companies prevent further duplication and make some arrangement to eliminate unnecessary duplication. Further duplication will be necessary if the Merchants' Company carries out the provisions of the recent street-lighting contract with the city. The service was formerly performed by the Indianapolis Company and the Company has large sums of money invested in equipment for this service. The street lighting situation is one of the matters being considered by the Commission.

The Comission is also in communication with the Central Union Telephone Company and the Indianapolis Telephone Company, with a view to eliminating the evils of unnecessary duplication and division of telephone business in Indianapolis. A merger of the companies or a physical connection between the systems is suggested. Both companies were ordered to submit detailed physical valuations of their local exchange property.

ILLINOIS.

Charles N. Hebner has resigned as secretary of the Commission. No one has been appointed to fill the vacancy, but R. V. Prather, assistant secretary, is now acting secretary.

MARYLAND.

Judge W. Laird Henry, formerly judge of the Court of Appeals of Maryland, has been appointed as a member of the Public Service Commission to succeed Philip D. Laird, whose term expired the last of July. Judge Henry is a Democrat and one reason for his appointment was the desire to establish a precedent for minority representation on the Commission, which is not provided for in the law. The retiring commissioner was chairman of the

board and Commissioner Albert G. Towers has been designated as chairman.

MASSACHUSETTS.

Annual Report. The twenty-ninth annual report of the Board of Gas and Electric Light Commissioners has been published covering, in the usual manner, the work of the Board for the year ending June 30, 1913. The decisions of the Commission, special reports to the Legislature, court decisions and new legislation affecting the jurisdiction and work of the Commission, and compilations of statistics of gas and electric companies, private and municipal are included. Rate schedules of all the electric light and power companies, as of June 30, 1913, for commercial and street lighting service are compiled. The prices charged by municipal plants are given for commercial lighting and power and the cost to the municipality for street lighting is estimated from data available in each case.

NEW YORK—First District.

The Edison Electric Illuminating Company of Brooklyn was authorized to acquire 122 shares of the capital stock of the Amsterdam Electric Light and Power Company. This approval will make it possible for the Edison Company to own all the stock of the Amsterdam Company. The Commission's order provides, however, that such approval must not be interpreted as approval of the merger of the wo companies, which is in contemplation. The Corporation Counsel of the City in a suit that has been brought, claims that the Amsterdam Company has lost its franchise for non-use.

Second District.

The Depew & Lancaster Light, Power & Conduit Company was authorized to take over the Depew and Lancaster Corporation. All of the stock of the latter company is to be exchanged for the stock of the absorbing company, $133,675, share for share. The Depew & Lancaster Light, Power & Conduit Company is to issue $255,000, five-per-cent, 40-year, first-mortgage gold bonds. The proceeds are to be used to cancel the mortgage of the Depew and Lancaster Corporation, to discharge the obligations of both companies, to pay organization expenses, and to provide for working capital.

The Commission, in its order, sets forth a detailed plan for the proper method of amortizing the debts thus funded.

Randolph Light & Power Company. The Commission has authorized the transfer of the property, rights, and franchises of the Randolph Light & Power Co., a co-partnership of J. W. Grace and A. W. Woolworth, to the Randolph Light and Power Co., Inc. The latter company is to issue $16,000, of its six-per-cent first-mortgage bonds and $17,000 of its capital stock, both lots to be sold at or above par; $17,000 will be paid for the plant of the co-partnership, $8,500 will be expended on transmission distribution and street lighting in the company's territory in Connewango and Cherry Valley, and $6,000 will be used to meet a mortgage now held by J. W. Grace and A. W. Woolworth.

The Hannawa Falls Water Power Company was authorized to purchase a controlling interest in the stock of the Northern Power Company. An issue of $749,000 of first and refunding-mortgage collateral-trust five-per-cent gold bonds was authorized, $138,000 of this issue to be used to acquire 1,380 shares of the stock of the Northern Power Company. This consolidation will greatly improve electrical facilities in northern New York. Additional energy will be secured to make up power shortages in this district.

The Central New York Gas & Electric Company was authorized to issue $128,000 of its five-per-cent first-mortgage gold bonds at not less than 90. The sum secured by this issue is to be expended on equipment for both the gas and electric departments.

The Empire Gas & Electric Company was authorized to issue $137,000 of five-per-cent joint first and refunding-mortgage bonds, at not less than 90. The electric department will expend $48,506.61 for overhead and underground conduits and cables, street-lighting equipment, and transmission lines and equipment. The balance will be expended for equipment in the gas department.

The Mexico Electric Company was authorized to issue $41,000 six-per-cent 20-year, first-mortgage bonds and $20,000 capital stock for not less than par. The proceeds are to be expended for extensions and improvements to its plant and distribution system.

The Deer River Power Company was authorized to issue $45,000 of six-per-cent gold-mortgage bonds at not less than 90, which, with a previously authorized issue of $25,000 capital stock, will be used to pay off floating and other indebtedness.

The Rochester Telephone Company was granted authority to issue $100,000 of five-per-cent 30-year general-mortgage bonds at not less than par for new construction and extension to its exchange and system.

OHIO.

The Dayton Power & Light Company was authorized to issue $2,579,000 first and refunding-mortgage, five-per-cent gold bonds to be issued for the purpose of refunding and reorganizing the bonded indebtedness of that portion of the company's property formerly known as the Dayton Lighting Company.

WISCONSIN.

A statement has been prepared by George C. Mathews, public utilities statistician of the Wisconsin Railroad Commission, replying to charges against the Commission's work contained in a pamphlet, "Regulation of Public Utilities in Wisconsin," published by the Minneapolis Home Rule League, and to similar charges contained in a paper by Stiles P. Jones, secretary of the Voters' League of Minneapolis, which was published in the May number of "The Annals." Mr. Mathews reviews the evidence set forth in both papers and points out facts incorrectly reported and judgments which appear to be false and biased.

Court Decision. The case of the Duluth Street Railway Company vs. the Railroad Commission was handed down by the Circuit Court of Dane county on July 27. The plaintiff operates a street-railway system in Superior, Wis., and Duluth, Minn., and an interurban system between these two localities. In November, 1912, the Railroad Commission upon investigation reduced the rate of fare in Superior from five cents per ride to six rides for a quarter. The traction company thereupon appealed to the court.

The main contentions of the plaintiff were that the Commission's order violated the obligations of contract, that the valuation placed upon the company's property was too low, and that the Commission did not allow an adequate rate of return.

On the first point the court states that the franchise of the traction company clearly indicates that the five-cent fare provision was merely a limitation on the amount of fare that may be charged and was in no way contractual. The court further states that the sovereign power of the state to regulate rates was not given up in this case.

The court holds that satisfactory proof had not been offered to show that the plaintiff's property exceeded the valuation placed thereon by the Commission. Neither was the court convinced that the rate of return allowed the plaintiff was insufficient. On this latter point the court points out that the "business of the plaintiff has passed the experimental stage." The court upheld the rate fixed by the Commission and dismissed the action of the traction company.

It is expected that the case will be appealed to the Supreme Court.

Fall River Telephone Company. Residents of Fall River complained to

the Commission that the telephone service of the local company was inadequate and that, since the Commission had ordered a physical connection between the local company and the Wisconsin Telephone Company's lines running to Columbus, the latter has withdrawn direct connection between Fall River residents and its Columbus exchange and is at present giving inadequate service. The complainants asked that the Wisconsin Telephone Company extend its lines into the village.

The Commission finds that the legislative intent is against duplication of existing equipments, and, even if such were not the case, that it is without jurisdiction to order the proposed extension. The complaint as to local service is also dismissed, it appearing that such service has been improved to the satisfaction of all parties to the proceedings.

The Superior Water Light & Power Company was authorized to issue $100,000 of common stock, the proceeds to be used in making extensions and additions to the company's plant.

The Lynn Telephone Company was authorized to issue $3,750 of stock. The issue is to cover the value of the company's existing property, it appearing that this is worth the authorized issue, although at present only capitalized at $1,500. The Commission's order provides for the transfer of one $25 share for each $10 share of the present stock.

The Westby Telephone Company was authorized to issue $6,050 of stock. The proceeds are to be used in purchasing real estate and constructing a telephone exchange and office building.

District Lighting Law.

At its last session the Legislature of Utah passed a district lighting law intended to allow a city to create special lighting districts and assess the cost of improved lighting to abutting property owners in the same manner in which other street improvements are made. According to the city attorney of Salt Lake City the law has been found defective in its working provisions and no attempt will be made to utilize it until an amended bill has been presented to the next Legislature. Among other things it fails to specify the manner in which the assessments might be levied.

Copper Exports.

Exports of copper during July totaled 34,145 tons, as against 29,096 tons same month last year.

The State of Texas mined 2,429,144 short tons of coal in 1913, valued at $4,288,920.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 231.—Short-Circuit on Induction Motor.—What is the simplest way to test an induction motor for shirt-circuit in the coils? Does a short-circuit usually burn the coil out entirely?—H. E. M., Galesburg, Ill.

No. 234.—Vertical Electric Sign.—In the case of a vertical electric sign of box section, about one foot square and about 12 feet high, that is to be mounted on the corner of a hotel building and have lettering on all four sides so as to be easily read from any direction on the intersecting streets, how should the lamps be arranged to get all parts of the letters uniformly lighted and yet use a minimum number of lamps?—C. L. T., Brooklyn, N. Y.

No. 235.—Size of Rotary Converters.—What limits the size or capacity for which a rotary converter can be built? I understand that certain railways would like to use sizes larger than the manufacturers can furnish.—C. A., Washington, D. C.

No. 236.—Electrolytic Arresters.—Is there any advantage in charging an electrolytic lightning arrester through a resistance, and if so, is this advantage sufficient to warrant the expense of charging resistances for a small system?—R. M., Philadelphia, Pa.

Answers.

No. 227.—Rewinding Another Motor.—I have a General Electric one-sixth to one-eighth horsepower, 110-volt, direct-current motor, whose armature core is 3.25 by 3.25 inches and has 12 slots. The commutator has 24 segments. The original armature winding has 150 turns of No. 31 wire; the fields have 550 turns of No. 28 wire. I want to rewind it to run on 120-volt, 60-cycle, single-phase circuit. What size of wire and how many turns must be used on the fields and armature?—W. T. E., Ansonia, Conn.

Note the original winding of the armature and then strip the core bare. Take a rat-tail file and file out the slots until they are large enough to receive as many turns as originally used, but of a size of wire two numbers larger. If the old wire was of No. 31, the new winding should be of No. 29. Wind the armature with the larger wire in the same manner as originally wound, except that when connecting up to the commutator carry the terminals five segments to the right or left of the original connection. This is of course equivalent to shifting the brushes five segments. If the fields were formerly wound with No. 28 wire they should be rewound with No. 26 wire and be connected in parallel with each other and in series with the armature. If preferred, they may be wound with No. 22 wire and connected in series. This answer applies only to motors with laminated fields. It is not necessary to get the same number of turns on the armature or field as originally, but the nearer you come to it the better, and the less heating there will be.—A. J. W., Cleveland. O.

No. 228.—Panelboards.—Are panelboards made in which the three leads are 110-volt three-phase and all the branch circuits single-phase, being evenly divided among the three phases? If such a panelboard is not on the market, could one be built with a four-wire, three-phase main, the single-phase branch circuits being connected between the three outer wires and the neutral?—J. B. E., Evanston, Ill.

The accompanying illustrations, Fig. 1 and Fig. 2, illustrate the difference in connections between a three-to-two-wire panel connected for the Edison three-wire system and the same panel con-

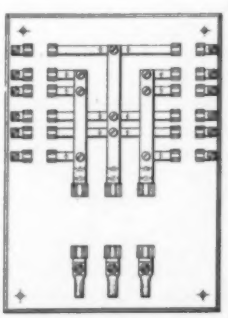


FIG 1
3 TO 2 WIRE
EDISON 3 WIRE SYSTEM

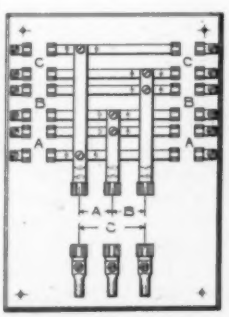


FIG 2
3 TO 2 WIRE
3 PHASE

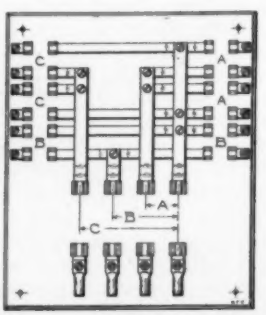


FIG. 3
4 TO 2 WIRE
3 PHASE WITH NEUTRAL

nected for three-phase. It will be noted that while the Edison three-wire panel is balanced if the number of circuits can be divided by two, the three-phase panel is balanced only if the number of circuits can be divided by six, or by three if single-branch.

Special panelboards are often built by Crouse-Hinds Company for three-phase, four-wire service. These panels are generally employed in factories where 220-volt, three-phase motors are used and the lights are connected to the same set of feeders. The transformers are connected in star, and a neutral wire taken from the center of the star. The voltage relations may be represented by an equilateral triangle, each side 220 units long, with a line A, B, or C, from each vertex to the center. The length of the lines A, B, and C, is not 110, but 220 divided by the square root of three, or approximately 127. That is, 125-volt lamps should be used instead of the usual 110-volt lamps. If it is desired to keep the voltage at the lamps 110, the transformers must be arranged to give 110 times the square root of three, or 191 volts, between the outer wires.

Fig. 3 shows the usual scheme of connections for this type of panelboard. The panel can be balanced if the number of circuits is a multiple of six, or of three if a single-branch panel is used. A single-branch panel is one in which the branch circuits are all on one side of the panel.—H. P. H., Syracuse, N. Y.

No. 229.—Liquid Air for Ice-Making.—Has liquid air ever been used in place of ammonia in commercial ice-making plants?—W. R. T., Fort Wayne, Ind.

No. Liquid air has never been employed in commercial ice-making plants, and it will never be possible to employ it for that purpose, because it requires not only practically but theoretically too, much more energy consumption than by means of the common ammonia process. For instance, it requires practically about 110 horsepower-hours to produce 13.2 gallons of liquid air, a quantity which has the same cooling effect as 100 pounds of ice, and which quantity of ice can be produced with an energy consumption of a little less than 2 horsepower-hours. Therefore it may be said, that the energy consumption to produce the same cooling effect would be about 50 times as much employing liquid air, than by means of the ammonia; the absolute efficiency of the liquid-air-producing machine is in this case about 15 per cent. This also shows evidently, that even if a machine could be invented, to work with 100 per cent efficiency (which is of course impossible), it would be much more wasteful, in energy and cost, than the actual ammonia processes.—A. G., Wilkinsburg, Pa.

No. 232.—Simple Intercommunicating Telephone.—Is it possible to wire a simple telephone onto an ordinary buzzer or bell circuit between two offices about 180 feet apart in the same factory building? If so, how can it be done? Is it possible to talk both ways or only one way?—N. D. J., St. Louis, Mo.

In the accompanying sketch will be found a very simple way of connecting up a telephone line, as stated in the above question. The terminals marked L should be connected to two wires running between the stations. The terminals marked B should be connected to two or three dry cells. These cells furnish the necessary current for talking and ringing. It must be understood that both stations must be wired exactly like the diagram. The induction coil shown here should have a secondary with a resistance of about 50 ohms if used with a standard receiver, which is generally about 75 or 80 ohms. When using a telephone wired like this diagram, the buzzer on the calling station will ring as well as that on the station called, when the button is pushed. If this is objectionable it may be avoided by taking the receiver from the hook before pushing the button.

This arrangement makes a very simple intercommunicating telephone system and can be used on a circuit with two or even three stations. In connecting more than two stations on the same line, all

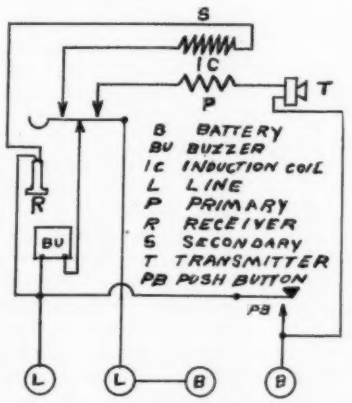


Diagram for No. 232.

terminals marked L must be connected in parallel, and the buzzers should be of fairly high resistance.—G. W. C., Roslindale, Mass.

No. 233.—Life of Vehicle Batteries.—Some 15 years ago the average life of a storage battery used in an electric vehicle was only one year. What is regarded as the average life now of a high-grade battery in vehicle service of medium character, that is, between that of a heavy truck and a light pressure car?—E. P., Chattanooga, Tenn.

Fifteen years have seen a great improvement in the construction of storage batteries and the average life has been increased to 5 or 5.5 years. This is now considered a fair average life for storage batteries used in electric vehicles. A storage battery used in a heavy truck, if properly cared for, will outlast one used in a light pleasure car. The average drop in mileage during the life of the battery is from 10 to 20 per cent.—H. O. P., Beardstown, Ill.

Meeting of Massachusetts Electric Lighting Association.

The twenty-fifth annual meeting of the Massachusetts Electric Lighting Association was held at the clubhouse of the Corinthian Yacht Club, Marblehead, July 29.

Sixty members of the Association, representing nearly all the companies in the State, were present.

Charles L. Edgar, of the Boston Edison Company, president of the Association, was in the chair, and the annual report of the Executive Committee was read by the secretary and counsel for the Association, Everett W. Burdett. The report gave a comprehensive resumé of legislation, proposed, enacted and defeated, which has come before the General Court of Massachusetts at its session lately adjourned.

"The legislative year of 1914," said the report, "has been one of great importance to the lighting interests of Massachusetts, and at one time threatened to be seriously harmful to those interests."

Nothing seriously detrimental was enacted. A number of bills on the subject of municipal ownership were introduced but did not pass. A bill authorizing the city of Brockton to establish a municipal plant failed of enactment.

The following bills were rejected: providing that no electric current shall be sold "at a price less than the total cost of production"; that a minimum price for electricity sold to the city of Boston shall not exceed the lowest price charged to any other corporation or person in said city; that no company shall allow any discount or rebate proportioned on the number of years for which a contract shall be in effect, and that the rates to any municipality shall not be varied because of the length of time for which the contract is made.

Several bills to require that duplicate readings of meters be furnished to customers resulted in an act which provides that on request a record of readings be given customers.

A bill to reduce the minimum charge for electric meters from $9 to $5 a year was rejected, after passing one branch, also a bill which required all electric light wires to be placed underground before January 1, 1916. A bill for the burying of wires in Chicopee was referred to the next session of the Legislature.

By an act which was shorn of its original objectionable features, the city of New Bedford was required to bury its wires.

The most important measure was the legislation, initiated two years ago, to revise and codify the laws relating to the manufacture, transmission and sale of gas and electricity, and to bring hydroelectric companies under the same regulation as that provided for the lighting companies.

The report read by Mr. Burdett said: "While the revision and consolidation of the numerous and somewhat obscure and complicated laws was generally recognized as desirable, the means and methods of bringing so-called hydroelectric or power companies within the operation of those laws, particularly with respect to their official supervision, regulation and control, was found to involve radical differences of opinion and difficulties of a most serious kind. This was also true of a bill introduced by the Board of Gas and Electric Light Commissioners to the effect that in passing upon the authorization of the issue of stocks and bonds the Board 'may refuse to approve the issue of stock or bonds if in its opinion such issue would be inconsistent with the public interest.' This was objected to as giving the Board absolute power in this important and vital matter, and as substituting for the provisions of existing law the uncontrolled discretion of the Board."

The result of the several long and earnest conferences that followed upon public hearings was a happy and somewhat unexpected agreement upon the terms of the legislation proposed. The matter of the Board's discretion in the authorization of the issue of stock or bonds was finally disposed of by a provision that "the Board may take into consideration any resources of the companies available for the purpose for which such issue has been authorized by the corporation."

While this did not meet the views of all parties in interest, it was the only compromise found to be practicable.

The recommendation of the Governor that municipalities be exempt from the compulsory purchase of private plants in certain cases was disposed of by repealing the provision for special commissioners to appraise plants taken over by towns or cities, and substituting therefor a provision that the matter shall be referred by the Court to the Board, who shall fix the value of the property and settle details of the transfer. The Board's finding, when accepted by the Court, is final, and "the award shall not be set aside or recommitted for error in law unless the Court is satisfied that such error has substantially affected the interests of the party complaining thereof. In such an event the Court may recommit the same to the Board with such directions as justice may require." The expense of litigation, if any, may be reckoned as part of the indebtedness for which bonds may be issued. The Board may take into consideration any depreciation of plant which took place prior to purchase.

Great difficulty was found in dealing with the hydroelectric companies. The Electric Light Commissioners urged the bringing of these companies within the scope of the laws regulating securities, price of service, etc., applicable to steam companies engaged in the manufacture, distribution and supply of electricity. The water-power interests were not adverse to being brought within the scope of the laws referred to, provided it was done upon terms satisfactory to them. These terms were, however, as originally proposed, antagonistic to the interests of existing electric lighting companies. A conflict thus arose between the two interests, as well as between them and the public authorities.

One of the fundamental propositions insisted upon in behalf of existing companies was that the so-called hydroelectric or power companies should not have any rights in the distribution of electricity for power purposes only, which could not be enjoyed by existing electric lighting companies. "The supply of electricity in bulk" was defined in the act, as proposed, in such a way as would enable the hydroelectric companies to supply electricity in large units to a large class of desirable customers, without being under any obligation to furnish electricity for any other purpose or in smaller quantities; whereas an electric lighting company desiring to furnish electricity in bulk would be subjected to the possibility of being required to furnish electricity in the same territory to all persons for all purposes and in all quantities. Such a distinction might easily make such supply profitable to the first class of companies and unprofitable to the other. It was believed that a provision putting the two classes of companies on a parity in this respect, not only would give the larger companies generating electricity by steam an opportunity to compete with the water-power companies for the supply of "electricity in bulk" in new territories, but would be of still greater advantage to municipalities and smaller companies in furnishing them an opportunity of getting competitive prices for bulk supply.

Furthermore, the importance was recognized of having the law so shaped that the transmission companies practically could not invade the territory of local electric light companies except for the purpose of furnishing "electricity in bulk," and then only after application to and approval by the local authorities and the Board of Gas and Electric Light Commissioners.

By the act all companies furnishing electricity, whether from water power or by means of steam, are put upon the same basis as to regulation, competition, etc., and all are allowed to offer to supply "electricity in bulk" in a given territory without the obligation to supply electricity to all applicants for all purposes. But in consenting to the laying or erection of the wires of a company for the sole purpose of supplying "electricity in bulk" in any given territory, the local authorities in the first instance and the Board of Gas and Electric Light Commissioners on appeal may, in addition to any provisions of law governing such companies, impose such other terms, limitations and restrictions as the public interest may in their judgment require. Moreover the Board, instead of being limited as in ordinary cases to affirming or disaffirming the action of local authorities, may in this case affirm, amend, alter or add to the terms, limitations and requirements imposed by the local authorities, so far as the public interest may in its judgment require.

An earnest effort was made in behalf of the existing companies to embody in the act a statutory limitation of the unit of supply which could be furnished by a company supplying electricity in bulk. This, however, it was found impracticable to secure.

A new provision was secured, giving electric companies the right, under certain fully defined terms, conditions and limitations, to take land necessary for constructing portions of their lines.

At the close of the formal report, Mr. Burdett gave some pleasant and interesting reminiscences of people and incidents connected with his quarter-century of service as secretary and general counsel. He referred to the altered attitude of companies to the public as being one of greater frankness now than in days past.

W. Rodman Peabody, counsel for the Turner's Falls Company, who was the special guest of the occasion, made some felicitous remarks and presented to Mr. Edgar and Mr. Burdett each a silver bowl, appropriately engraved with words of appreciation of these gentlemen's service to the Association.

The present officers were re-electd, with the exception that Albert B. Tenney, of the Malden Electric Light Company, was chosen vice-president, to succeed Charles F. Prichard, deceased, and Oliver Prescott, New Bedford Gas and Edison Light Company, a director.

THE INDETERMINATE FRANCHISE OR PERMIT.—II.

By Halford Erickson.

Amortization and Other Special Charges.

We hear a great deal about amortizing part or all of the various items that enter into the cost of public-utility plants and their business. Some hold that certain items only should be amortized. Others again urge that the entire cost of the utilities should be wiped out in this way. They treat the matter lightly, often as a mere matter of bookkeeping only. The fact that the amortization charges must come out of the customers of the plant whether they are few or many and that they must be levied on top of a reasonable return for operating expenses including depreciation, ordinary taxes and interest, and profit on the investment, and that they are apt to make the rates so high as to be prohibitive does not seem to some to be even worthy of notice. Interest and profit must be paid in order to secure capital and the enterpriser. Depreciation must be provided for since the plant will not render adequate service unless it is maintained in a good condition. Wages, material and services must also be regularly met if the plant is to be kept in operation. All of these charges and outlays are necessary in order to obtain the use of the various factors of production. They must also be met ahead of amortization and other special charges.

Under a system of limited franchises of 20, 30 or 40 years, such as largely prevailed in Wisconsin prior to the adoption of the public-utility law, with its indeterminate-franchise feature, a public rate-making body would be bound in adjusting the rates of a particular utility to consider the length of its franchise, and to make some provision for a fund during the remainder of the franchise period which would care for its possible destruction by the termination of such franchise period. If, at the end of such period, no renewal of the franchise were to be granted, and the municipality to construct its own plant and system, the property loss would be large; if, at the end of such period, the franchise were to be renewed, or the property purchased by the municipality at a fair figure, the property loss to the utility, due to expiration of franchise, would be comparatively small. The matter of adjusting rates, however, would probably precede by many years the expiration of the franchise and there would be no precise way of foretelling what the future would bring forth. To insure to the utility the unimpairment of its investment at the end of the franchise period, the duty would fall upon the rate-makers to so adjust the rates that for the unexpired term the company might set aside a reserve in addition to its operating expenses including the depreciation and return for interest and profit reasonably adequate to take care of the loss which, so far as could be foreseen, would probably ensue on the termination of the franchise. In other words, a new element would thereby be added which would have to be considered in the fixing of rates and one which would largely add to the return which the utility might properly demand from its cosnumers. This, of course, would result in much higher rates than those required under an indeterminate franchise, the extent of the excess being dependent on the length of the franchise, the time when the rates were adjusted, and other facts.

The real significance of amortization charges becomes most apparent when they are reduced to the cost per unit of service. For five typical lighting plants serving cities in which the population ranged from about 1,000 to about 350,000 inhabitants the annual charges necessary for amortizing the cost of the plants in 20 years on a four-per-cent sinking-fund basis amounted to from 1.33 to about 2.00 cents per kilowatt-hour for the ordinary short-hour lighting user and from about 0.4 to nearly one cent per kilowatt-hour for the average eight-hour-a-day power user. It is hardly necessary to say that these excesses in the rates because of the amortization charges, are great enough to be burdensome to the ordinary user, and to prevent the proper development of the service, or saturation of the territory. They would therefore prevent many from availing themselves of the conveniences which such services offer and which it is their real purpose to furnish. They would make the existing generation bear excessive charges which it cannot afford to bear in order that succeeding generations may enjoy these facilities at unduly low rates. The injustice of this is all the greater since the amortization charges would have to be borne while the communities were smaller and the cost per unit of service comparatively high. For we all know that the cost per unit of utility service tends to decrease with increases in population or the number of consumers.

What has thus been said of the amortization of the cost of the plant would also in the main apply to such extra charges as license fees, franchise taxes and even to certain street-paving obligations and unwise extensions of the plant. Such charges are simply a form of indirect taxation levied upon the users of the services of the utility. In most cases these taxes are also of such nature that they should be borne by the property generally or the taxpayers in proportion to the property owned rather than by those who depend upon such necessities as those furnished by public utilities, and in proportion to the use made of such necessities. Special taxes of this sort may easily be as large and as burdensome as amortization charges and may have an equally bad effect upon the growth and development of the service.

When the real facts are brought out it thus appears that amortization charges, license fees and other special charges by the municipality over and above the regular taxes are more than likely to become unjust burdens not only to those who depend on the services rendered by public utilities but to the utilities themselves. The Wisconsin public-utility law was intended to dissolve some of the injustice and many of the perplexities that are involved in such practices. Thus by granting an indeterminate franchise subject to certain conditions until the property involved is taken over at a fair price, amortization charges become unnecessary. By making such permit exclusive during good behavior, adequate service at reasonable rates can be much more easily enforced. By providing that only reasonable and necessary charges shall be included in the cost upon which the rates are based the service can be had at the lowest practicable rates. Since services of this kind are necessities especially to those who live in cities and villages, they should be made available to as many as possible. Since such availability very largely depends on the prices charged for the service and since these prices tend to fall with increases in the volume of business it would seem almost superfluous to say that public convenience and welfare require that such service should be produced at the lowest possible cost and furnished at the lowest practicable price.

The Status of the Municipality Under the Indeterminate Permit.

One of the common criticisms of the present method of state regulation of utilities in Wisconsin is that under the indeterminate permit cities are shorn of their power to control their local utilities. This criticism is grounded upon ignorance of the provisions of the utility law, as well as of the powers which cities could exercise under the old franchise conditions. Quite the contrary of the assumption underlying this criticism is true. The powers of municipalities over local utilities are greater now than they were in the earlier franchise period. The conditions existing in Wisconsin prior to the enactment of the utility law are made plain in the record of the case of the City of Madison vs. the Madison Gas & Electric Company (108 N. W. Rep., 65) decided in 1906. Action had been brought by the city at the request of citizens to compel the gas company to supply its products at lower rates. The city made application for authority to examine the company's books to enable it to frame its complaint. The gas company applied to the circuit court for an order restraining the plaintiff

from further proceedings. This motion was denied by the circuit court, but on appeal the Supreme Court reversed the lower court and remanded the cause with directions that the case against the gas company be dismissed. The court in substance held, in the opinion, that while the court had power to determine whether a given rate in issue were reasonable, "the power to prescribe what the charge shall be for services rendered in the conduct of a business impressed with a public interest is vested in the Legislature, and it must be exercised by it directly or through some appropriate agency."

The above decision was handed down shortly before the public-utilities law was enacted. Today under the public-utility law the municipalities not only have greater powers than formerly but they can have the matter complained of investigated at a much lower cost and at much less trouble to it than was possible prior to the enactment of this law. All that is necessary to do to that end is that the city file a complaint with the Railroad Commission, for upon the receipt of such complaint the Commission enters on an investigation of the same and assumes the burden of practically all the work that is required to arrive at a fair conclusion therein. To this end it tests the service, appraises the plants, audits the books and records, determines what constitutes reasonable allowance for the cost of the service not only for the plant as a whole but for each branch of its business, and upon such allowance computes the rates by which they must be covered. If the orders of the Commission are appealed to court they are defended by the state without direct cost or trouble to the municipality. In addition to this the Commission through its uniform accounting systems and periodical reports, as well as by direct examination of their books and records, is also closely scrutinizing the earnings and expenses of the utilities from year to year, and when it discovers that any utility is clearly earning more than reasonable returns it reduces its rates on its own motion. This is actually what has taken place in the city of Madison. For in this city the Commission has made one reduction of the rates on complaint by the city, while it has twice afterward lowered these rates on its own motion and wholly without the city having any knowledge of the proceedings. These reductions were made possible through the rapid growth of the business and through enforced economies of operation by which the expenses were lowered. If the city desires to go further than this and to acquire and operate the utilities it can do so today under the public-utility law much more quickly and conveniently and even at less expense than was possible before this law was enacted.

In addition to this the municipalities are now empowered to regulate the service and adjust other conditions in the first instance. These powers are granted as follows:

"Every municipal council shall have power: (1) to determine by contract ordinance or otherwise, the quality and character of each kind of product or service to be furnished or rendered by any public utility furnishing any product or service within said municipality, and all other terms and conditions not inconsistent with this set, upon which such public utility may be permitted to occupy the streets, highways or other public property within such municipality and such contract, ordinance or other determination of such municipality shall be in force and prima facie reasonable; (2) to require of any public utility by ordinance or otherwise such additions and extensions to its physical plant within said municipality, as shall be reasonable and necessary in the interest of the public, and to designate the location and nature of all such additions and extensions, the time within which they must be completed, and all conditions under which they must be constructed, subject to review by the Commission; (3) to provide a penalty for non-compliance with the provisions of any ordinance or resolution adopted pursuant to the provisions hereof."

From all this it will be seen that municipalities now have the power (1) to regulate the quality of the service, the extensions of the plant and other conditions in the first instance; (2) to grant or withhold permits for the use of its streets and highways for public-utility purposes; (3) to cause the Railroad Commission to investigate the adequacy of the service and the reasonableness of the rates and other conditions and to require it to establish adequate service and reasonable rates and just conditions in other respects; (4) to acquire the property and business of the utility at the price fixed by the Commission, which price must be fair and equitable to all concerned; and to operate such utilities in the interest of the public; and (5) to secure from the Commission whenever conditions are such as to demand it, a certificate showing that public convenience and necessity require a second or competing utility, and to grant a permit to such competing utility authorizing it to use its streets and highways for public-utility purposes.

That the powers of the municipalities over their public utilities are greater today than they were before the public-utility law became effective is so clear that further comments thereon are superfluous. While all this is true it is at the same time the fact that few of them ever attempt to exercise all of these powers. One reason for this probably is that the proper determination of what constitutes adequate service and reasonable rates requires the services of experts and that such services are more costly or require greater expenditures than the municipalities feel justified in making. It is an established fact that work of this nature can be carried on at a much lower cost by the state or on a larger scale than separately by the several municipalities.

Effect on Municipal Ownership.

The indeterminate-permit feature of the public-utility law is also objected to by some because they fear it will tend to promote municipal ownership of public utilities and by others because they fear it will tend to retard such ownership. The former position is largely based on the fact that under the indeterminate permit and the public-utility law the methods by which such utilities can be taken over by the municipality have been somewhat simplified. In connection with this it may be said that the taking over of a utility is so important a step that it is not likely to be taken merely because the machinery for doing so has been made less complicated. There is nothing to indicate that the framers of the indeterminate-permit law desired to either promote or retard municipal ownership or to arbitrarily deprive utility owners of their property. All they apparently had in mind was to provide a franchise or permit that offered greater protection to both the public and the utilities than was afforded by the existing franchises and to assist in providing an effective system of regulation. To this end it was thought necessary to place in the hands of the municipality the power to deal promptly and effectively with those utilities which might refuse to either meet the service needs of the community or to sell out to someone else. If the community needs utility service and is not to be helpless in the presence of arbitrary or unreasonable utility owners it must have some power that is akin to the recalling of the grant under which the utility is operating.

Under the indeterminate-permit or public-utility law in Wisconsin several utilities, mostly water works, have been taken over by the municipalities. This fact, however, probably signifies little more than a continuation of the tendency on the part of municipalities to take over water works, which tendency has been rather marked for a great many years. The question of whether the utilities will be taken over by the municipalities is much more dependent upon the attitude of the public, the municipality's financial condition, the way in which the existing utility is managed or operated, and upon whether there is in existence an effective and prompt system of regulation, than upon the machinery and

processes by which the transfers are made. It is obvious that either or all of the reasons given may have important bearings, upon whether or not a municipality will embark in the public-utility business by taking over the utilities by which it is served and by operating them for the purpose of furnishing the service that is needed. A municipality that is without funds and that cannot lawfully issue additional bonds is of course not in position to meet heavy outlays for any purpose. Utilities that are well managed and that have the good will of its customers are not likely to be taken over, especially since under such circumstances the public might have more to lose than to gain by doing so. Effective regulation such as is provided by several of our utility laws tends to reduce the need for public ownership. Under such regulation the service is likely to be better and the cost of operation lower under private than under municipal operation. Such regulation, through strict systems of appraisals and accounting also throw much light on the real cost of furnishing the service, and the facts thus disclosed are mostly such as to have a deterring effect upon the desire of the municipality to take over the plants. Those, however, who are wedded to the municipal-ownership idea, and who advocate it as a matter of principle are not likely to change their views simply because such a venture may not turn out to be a profitable one to the public.

The objections to the public-utility and indeterminate-permit laws come largely from those who argue either for the most unlimited forms of home rule for the municipality, or for municipal ownership and operation of public utilities. As the home-rule idea and the public-ownership idea are based on government theories that differ somewhat from the theories upon which our public-utility laws are based, the objections to the latter are mostly of a theoretical nature. It is shown by experience, however, that the utility laws provide more effective and more equitable means of regulation than have so far been generally obtained under either local franchise regulation or public ownership. It was, in fact, because of the shortcomings of both of the latter methods of dealing with the utilities that the public-utility laws were enacted.

The public-utility and indeterminate-permit laws frankly recognize the fact that public utilities are subject to the same economic laws as other productive enterprises that are similarly situated. Such utilities, like other producers, must obtain the land, labor, capital and the enterpriser in open market, and must pay the ruling prices for these factors. These prices are fixed by forces over which neither the utility nor the state has much if any control. In obtaining these factors, however, and in employing them for the purpose of producing and furnishing public service, it is the duty of the utilities to exercise ordinary care and judgment. The cost of the service to the utilities under such circumstances also becomes the cost to the public; that is, the rates charged the public for the service must be high enough to cover this cost. The utilities must either pay the market price for the factors of production or stop their business; the public must pay rates that are sufficient to cover these costs or go without the service. Any deviations from this can only be temporary in their nature. One of the main functions of a utility commission is to investigate the situation and to determine what is the necessary cost of the factors of production to the utility and to the public, and to so distribute these costs through the rate schedules that each branch of the service and each customer are made to bear their just share of this cost. Higher rates than those for which all the factors of production, including capital and the enterpriser, can be had would seem to be unnecessary; lower rates than this means no service.

The Wisconsin Commission has had several rather sharp reminders of the workings of the economic laws in the public-utility field. Thus we have had to pass upon many cases where because the rates charged by the utilities for their services happened to yield lower returns than were necessary to cover the cost of the other factors of production, including the market rates for interest and profits, it was utterly impossible for the utilities to obtain new capital for much needed additions to their plants and to their service. The situation was in fact such that the public either had to pay higher rates or go without much needed service. When the Commission in some of these cases found that public interest required that the rates be raised just enough to cover the cost of the service and thus enable the utilities to obtain the additional capital that was so much needed for extensions of the plant and the service, it was most bitterly and intemperately assailed, not only by the local press, but by others. Similar criticisms have also been heaped upon the Commission in many cases when in public interest it has declined to reduce the rates below the cost of the service and below the level at which additional capital could be had. There are apparently many who fail to realize the fact that the utilities have to pay the market prices for the factors of production and that the commission by attempting to reduce the rates for the service to so low a point that the returns therefrom will not cover such costs or prices, is certain in the end to do the public much more harm than good.

Intelligent criticism is necessary, and one of the mainstays of democracy; unintelligent criticism and misrepresentation, on the other hand, are among its greatest dangers. In the past when comparatively little was known about the investment in our utilities and about their operating expenses, including the cost of capital and of the enterpriser and about their rate schedules, there may have been some justification for many misstatements of facts and erroneous conclusions therefrom, but today when the approximate cost values of the utilities are known, when their operating expenses are regularly reported and even audited and adjusted by commissions and others, when the cost of capital and of the enterpriser are studied and ascertained, and when these facts are published so that anyone who desires to know the truth can readily do so, there would not seem to be good reasons for either misstatements of facts or for erroneous conclusions therefrom. Yet there are many who disregard all this and who manipulate both facts and conclusions to suit their purpose.

When everything has been said, however, the fact remains that the indeterminate permit as a form of franchise affords more protection to both the public and the utilities than any of the various kinds of franchises by which it was preceded. In connection with the public-utility laws as a whole it constitutes a system of regulation that under existing condition appears to be more in line with public interest and to lead to more equitable results to all concerned than any system of regulation with which we have so far had any experience.

British Telegraphs.

The British Postmaster General has appointed a special committee to consider the organization of the telegraph service and make recommendations concerning what, if any, improvements can be made in respect of efficiency or more economical working. Sir Henry Norman and Sir C. Stewart-Wilson, two of its members, have had special experience in telegraph matters, the former as a deputy postmaster general and as a student and critic of imperial wireless matters, and the latter as an Indian Director-General of Telegraphs. An eminent accountant—Sir William Plender—is also on the committee, and his concern no doubt will be to see how the publicly owned telegraph system may be made profit-earning, other members handling the technical issues in the investigation.

Improvements in Long-Distance Telephony.

A lecture was given by J. A. Fleming on March 27 before the Royal Institution of Great Britain dealing with this subject.

Great advances have been made of late years in both the scientific theory and the practical appliances of telephony. Apart from the complications involved in working an exchange system into which a human, and therefore a fallible, element enters, there are special difficulties in telephonic transmission which are introduced by the line or cable. Professor Fleming conducted experiments to show the distortion in transmission through different lengths of cable of the current produced at the transmitting end.

Oliver Heaviside pointed out in 1887 that the distortion could be cured by giving the cable increased inductance and showed that waves of all lengths would travel with equal speed and have equal attenuation if the product of the inductance and leakage conductance were equal to the product of resistance and capacity of the line. It remained, however, for Pupin to show how this could be practically accomplished. He showed that if inductance coils were placed such a distance apart that there were eight or ten coils to the wave-length corresponding to mean speech frequency (800 cycles per second) the inductance would act as if evenly distributed along the cable and give the desired result. If the loading coils are too far apart there is a great loss of amplitude of the transmitted wave, owing to reflections at these points. The principal result of such loading is to reduce the attenuation and to make it more equal for waves of different lengths.

Two important characteristics of a cable are its attenuation constant and wave-length constant. The reciprocal of the attenuation constant is the distance in which the wave amplitude diminishes to 0.367 of its amplitude at the sending end. This decimal is the reciprocal of the base of the Napierian logarithms. The wave length constant is equal to 2π divided by the wave-length. Table I shows these values and the resulting velocity of transmission for different frequencies over a cable having the following constants per loop mile (a length of one mile of outgoing and return wire); resistance, 88 ohms; inductance, 1.0 millihenry; capacity, 0.05 microfarad. This shows that there is no particular velocity of electricity along a wire. The velocity depends upon the constants of the wire and the frequency of the oscillations. For a frequency of 800, corresponding to the note upper G in the treble clef, the attenuation constant is about 0.1, which means that in 10 miles the amplitude decreases to 37 per cent of its value at the sending end. The wave-length is 58.1 miles and the velocity 46,480 miles per second. The limit of speech on this cable is about 47 miles and there is considerable distortion of the waves. If, however, we insert in this cable at intervals of one mile, inductance coils such as shown in Fig. 1, having an inductance of 100 millihenries, the attenuation constant is reduced to about one-third of its previous value, the wave-length to about 18 miles, and the velocity to about 13,280 miles per second.

Such loading has resulted in a great

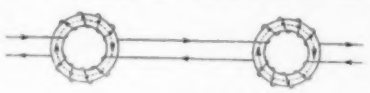


Fig. 1.—Loading Coils.

improvement in long-distance telephone lines. Three cases must be considered: overhead lines, underground cables and submarine cables. In the case of overhead lines the inductance coils are inclosed in iron boxes which are mounted on the posts. For underground lines they are put in iron boxes in manholes or pits. The problem of loading a submarine cable presented greater difficulties both in construction and in laying, but these have been overcome and two such cables have been laid across the English Channel. One of these is from England to France, and one from England to Belgium. Another

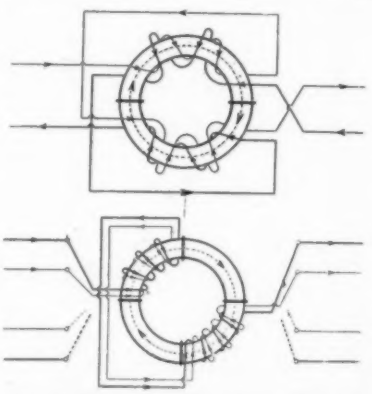


Fig. 2.—Connections of Loading Coils for Phantom Circuit.

type of loaded cable has been laid by the French between France and England. Another coil-loaded cable has been laid across the Irish Channel.

The cable laid in 1910 between England and France has a length of 21 nautical miles and contains four copper conductors forming two separate circuits. They are arranged so that there is no mutual inductance, and consequently no cross-talk. The copper is insulated with guttapercha and is armored. At intervals of one nautical mile, iron-core inductance coils are inserted in each line. Each coil has a resistance of six ohms and an inductance of 0.1 henry at 750 cycles per second. These coils are of such form that when insulated over they merely present a certain extra thickening of the cable for a length of about 30 inches. Without these loading coils the attenuation constant would be 0.052. With the coils it is 0.017.

The loaded cable between England and Belgium has a length of 48 nautical miles and is of the same general construction, but arranged so that its two circuits can be phantomed. It has been found possible to load the phantom circuit by inductance coils which are so wound that while they add inductance to the phantom they do not alter that of the component circuits, which have their own independent loading coils. This is shown in Fig. 2, where the upper diagram represents the mode of winding each loading coil placed in the side circuits of a pair-circuit cable. The lower diagram represents the mode of carrying each side-circuit pair of conductors round a loading coil, so as to load the phantom circuit. The winding of one side circuit only is shown.

The phanton circuit is better than either of the circuits of which it is composed, for each conductor of the phantom has double the section of copper of a component circuit. This reduces the attenuation constant and it is often possible to speak farther through the phantom circuit than through the component circuits. Telephonic conversation has been conducted experimentally between Berlin and London over this cable.

Another loaded submarine cable is in

TABLE I.—CONSTANTS FOR VARIOUS FREQUENCIES ALONG A STANDARD TELEPHONE CABLE.

Frequency.	Attenuation Constant.	Wave-Length Constant.	Wave-Length in Miles.	Wave Velocity in Miles per Second.
100	0.0370	0.0373	168.0	16,800
1,000	0.1134	0.1218	51.5800	51,580
10,000	0.2667	0.5181	12.1300	121,300
100,000	0.3095	4.4530	1.4110	141,100
1,000,000	0.3110	44.3700	0.1414	141,400

TABLE II.—LOADED SUBMARINE TELEPHONE CABLES.

All values are per nautical mile of loop at 800 frequency.

Cable.	Anglo-French Coil Loaded (1910).	Anglo-Belgian Coil Loaded (1911) Side Circuit.	Anglo-Belgian Phantom Circuit.	Anglo-Irish Coil Loaded (1913).
Length in nauts	21	48	48	64
Coil-spacing in nauts	1	1	1	1
Coil resistance in ohms	6.6	11.5	4.6	6.8
Total resistance in ohms	20.9	25.7	11.7	21.0
Capacity in microfarads	0.138	0.162	0.314	0.166
Inductance in henrys	0.1	0.1	0.05	0.1
Ratio S-C	120	12	12	15
Attenuation constant	0.017	0.018	0.0173	0.015
Total attenuation	0.36	0.86	0.83	0.96
Conductor weight per naut. in pounds.	160	160	320	160

course of construction between England and Holland.

The cable across the Irish Channel is 64 nautical miles long and is a two-circuit cable arranged for phantom working. It is the longest loaded submarine cable now in operation. Pupin coils are spaced at a distance of one nautical mile and the attenuation constant is 0.015. Details of these cables are given in Table II.

Another method of loading was suggested by the Danish engineer, Krarup, and is known as continuous loading. It consists of a stranded copper cable with a soft-iron wire wound uniformly and closely upon it in a spiral. This iron increases the inductance to a certain extent but also increases the capacity and the resistance. Nevertheless it reduces the attenuation constant. The French Government laid such a cable across the English Channel in 1912. It has a capacity between wires of 0.176 microfarad, inductance of 0.0135 henry at 1,000 cycles and an attenuation constant of 0.0185. The conductor of this cable weighs 300 pounds to the mile, which is twice as great as the coil-loaded cables above mentioned and its attenuation constant is greater than those.

The performance of these four cables and the resulting experience as to the cost of maintenance and repairs will furnish valuable data to guide the design for future loaded deep-seat telephone cables.

Other continuously loaded cables have been laid. One of these is in the Faroe Islands. Another, 31 nautical miles in length, is on the Pacific Coast between Vancouver Island and the mainland of British Columbia, and is the longest of its type. It is a two-circuit cable arranged for phantom working. The attenuation constant is 0.019.

When such loaded cables are connected at their ends to land lines which are not loaded there is loss of amplitude by reflection. It is consequently necessary to taper off the loading by increased spacing or gradual reduction of the inductance of the coils to reduce this reflection.

When the attenuation constant of a cable is known, the product of this constant and the length of the cable in miles gives a number called the total attenuation. Intelligible speech cannot be transmitted if the total attenuation of a line exceeds 4.5. For good speech it should not exceed 3. The extreme limit corresponds to about 47 miles of standard telephone cable. However, the total attenuation is not the only criterion of good transmission.

The longest loaded aerial telephone line at present in use is between New York City and Denver, Colo., a distance of over 2,000 miles. This line is of No. 8 copper wire weighing 435 pounds to the mile. The lines are twisted to prevent crosstalk and are associated in pairs, so that phantom circuits can be formed. The constants of each circuit when unloaded are, per loop mile, 4.14 ohms, 0.0091 microfarad and 0.0034 henry. They are loaded by inserting every eight miles loaded coils having an effective resistance of 6.5 ohms, and an inductance of 0.265 henry. The effective resistance per mile thus becomes five ohms and the inductance 0.0365 henry. The attenuation constant is 0.00125, so that the wave travels about 800 miles to reduce its amplitude to 37 per cent of the initial value.

Another long loaded aerial line has just

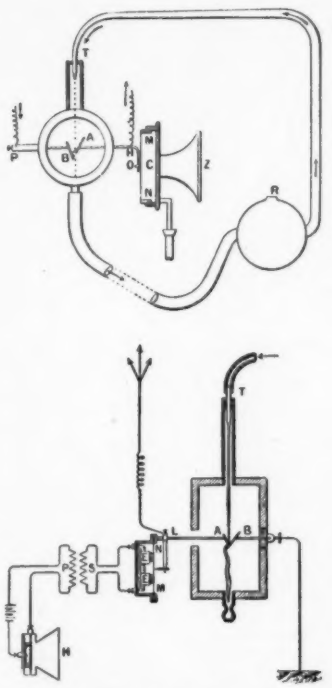


Fig. 3.—Vanni's Liquid Microphone.

been completed between Berlin and Rome, a distance of 1,300 miles. This includes a short length of uniformly loaded cable through the Simplon tunnel. The conductor consists of a pair of phosphor-bronze wires, 4.5 millimeters in diameter, weighing about 500 pounds per mile. The lead and return wires are 42 centimeters apart and loading coils are inserted every 6.2 miles. These coils have an effective resistance of five ohms and an inductance of 0.2 henry. The line has a total attenuation of 2.2.

There are in Great Britain over 30,000 miles of loaded telephone circuits, and 45,000 additional miles are now being loaded. The longest are two trunk circuits between London and Leeds, the details of which are given in Table III. The longest underground loaded cable in Great Britain is between Hull and New Castle, 154 miles long. The loading coils are 2.5 miles apart. The total attenuation is 2.3. An underground loaded cable is now being laid between London and Liverpool, a distance of 200 miles. This cable will be three inches in diameter and contain 50 circuits with air space and paper insulation. The loading coils will be 2.5 miles apart.

A loaded telephone cable has been laid between Boston and Washington, a distance of 475 miles. This contains seven circuits of No. 10 wires, which can be phantomed in pairs. The loading coils are 1.4 miles apart. The phantom circuits between New York and Washington have a transmission efficiency equal to 13 miles of standard cable, and between Boston and Washington equal to 26 miles.

Professor Fleming then discussed the possibilities of telephony without wires, and pointed out that only slight modifications of the apparatus used in wireless telegraphy are necessary. Continuous waves must be used having a frequency of 20,000 cycles or higher. A microphone is inserted in the antenna circuit at the sending station. This varies the resistance in the antenna circuit and consequently causes a fluctuation in the amplitude of the emitted waves. This variation in amplitude will affect the telephone receiver at the receiving station. The chief difficulty is that of constructing a microphone which shall be able to carry the large current necessary in an antenna which is to transmit to any considerable distance.

Vanni has invented an ingenious liquid microphone of this character. It is shown in Fig. 3. A jet of water which may be made slightly conducting by the addition of acid or salt emerges from an ebonite mouthpiece and falls between two inclined metal plates, A and B. One of these plates is fixed and the other is connected to the diaphragm of the transmitter. The liquid falls on one plate and rebounds to the other and makes an electrical connection between them. The movement of the diaphragm sets up oscillations in the liquid and also varies the distance between the plates. It consequently changes the electrical resistance. One of these plates

TABLE III.—LOADED AERIAL LAND LINES.

All values are per mile or per kilometre at 800 frequency.

Line.	New York and Denver.	Berlin and Rome.	Berlin and Frankfurt.	London and No. 6.	Leeds. No. 7.
Length	2000 miles	2082 km.	584 km.	189 miles	189 miles
Coil spacing	8 miles	10 km.	5 km.	8 miles	12 miles
Coil resistance, ohms..	6.5	5	8.7	6.6	4.0
Total resistance, ohms.	4.95	2.9	11.18	7.58	7.08
Capacity in microfarads	0.0091	0.0056	0.0055	0.0098	0.0098
Inductance in henrys..	0.0365	0.022	0.0461	0.037	0.0173
Attenuation constant ...	0.0013	0.0011	0.0019	0.00283	0.00372
Total attenuation	2.6	2.2	1.12	0.55	0.72
Conductor	Copper	Phosphor Bronze	Bronze	Copper	Copper
Weight or size.....	435 lbs. to mile	4.5 mm. diam.	2.5 mm. diam.	300 lbs. to mile	300 lbs. to mile

is connected to the transmitting antenna and the other to earth. Hence the amplitude of the emitted waves is modulated in accordance with the wave form of the speaking voice. Professor Vanni has used this transmitter with success between Rome and Maddalena (162 miles); Palermo (260 miles); Victoria (370 miles); and Tripoli (600 miles).

The chief difficulty in obtaining greater ranges is that of constructing a voice-varied resistance which shall be able to carry currents up to 50 or 100 amperes. There is no insuperable obstacle to present transmission across the Atlantic Ocean.

Lighting of the Tower of London.

The adaptation of modern devices to the monuments of a past age is nowhere better exemplified than in the excellent and up-to-date electric lighting installation of the historic Tower of London. This venerable structure, which was founded in 1078 by William the Conqueror, is today utilized by the British Government, in part as a barracks and in part as a public museum of antiquities.

The lesser structures of this group of buildings form a quadrangle bordering on a moat, now dry and used as a training ground for the soldiers. These structures are used as storehouses. Just inside this group is another and more pretentious line of buildings and towers, most of these being used for barracks, the rest comprising the residences of the governor and constable of the Tower, a hospital, the Chapel of St. Peter, and the public show places known as the Wakefield and the Beauchamp towers, and containing respectively the crown jewels and the relics of prisoners once incarcerated here.

In the center of the Tower area, and highest and most imposing of the rather miscellaneous collection of erections, is the famous White Tower. This noble structure is nearly square in form, is of three principal stories, and is surmounted by four turrets, of similar, but slightly various design, one on each of the corners. The White Tower is 107 feet by 118 feet in ground dimensions and is 90 feet high from ground to roof. The walls are very thick, being 15 feet in thickness at the lower story and 11 feet at the top. A wall of stone running north and south through the entire structure divides each floor into two rooms, of which the east room on each floor is slightly narrower than the west, while the Chapel of St. John, which occupies the southeast corner of the Tower, encroaches on the east halls of both the upper floors to the width of 31 feet, its length being 55.5 feet.

The fascinations of this storied monument beguile one to a dissertation on its historic treasures, but our concern here must be solely with the modern aspects of the place. While the White Tower is open to the public only in the daytime, though there are infrequent occasions for lighting for more or less private purposes at night, yet the prevalence of dark weather, especially in the winter, together with the inadequate window provision, renders artificial lighting necessary, and this need has been met recently by the present very efficient equipment.

The main hall of the first floor of the White Tower is known as the Great Banqueting Hall. The interior dimensions are about 83 feet by 35 feet, and the height about 18 feet. The floor area is broken by a double line of wooden posts which support the oak-timbered ceiling. The hall is lighted by four rows each, consisting of 16 55-watt metal-filament electric lamps, installed in pairs six inches below the ceiling. The two outer rows, these being next the stone walls, are 15 inches from each of the walls, while the inner rows are 18 inches inside the lines of posts. Each of the pairs of lamps is shaded by a bronzed porcelain shade, leaf-shaped and flat, and about 12 inches in diameter. The iron conduit inclosing the wires is carried along the ceiling in a square pattern, forming one side of a design, of which wooden lances form the other three sides. The conduit being of about the same size as the lances and similarly colored, makes the effect one of a complete square design of these ancient arms, and effectually disguises the presence of the modern and otherwise somewhat impertinent conduit.

In the center of the ceiling of this hall is a fantastic grouping of bayonets, cutlasses and pistols, which culminates in a cluster of swords forming a point. Near the outer edge of this grouping, just within the pattern are installed among the cutlasses, eight 30-watt tungsten lamps, and one lamp of the same capacity is pendent four inches from the apex of this gruesome chandelier. This novel installation illuminates directly the central object in the floor area of the hall—the beheading block and axe, which were used, in many executions, before the days of electric and other forms of enlightenment.

In addition to the principal illuminating units mentioned, there are in this hall two 30-watt tungsten lamps, suspended 8 feet above the floor and having ground-glass shades, to light a display of maps, plans and prints of the Tower, set forth in wall cabinets fastened to the west wall, and also two 30-watt lamps, 10 feet above the floor, and similarly shaded, which light two glass-covered cases containing models of the Tower as it appeared in 1842 and 1866.

Passing to the east room of this floor, known as the Lesser Banqueting Hall, we find the installation consisting of three chandeliers of iron, five-sided in form and about 2.5 feet in diameter, and fashioned to simulate the battlements of a castle. These are pendent from the ceiling by iron chains, the inverted lamps being about 9 feet above the floor and consisting, on each of the three chandeliers, of three pairs of 55-watt and two pairs of 40-watt lamps, installed in pairs, two inches between units, on the outer edge, and at the corners, of the chandeliers, which are located, one in the center and one equidistant from it and the end of the hall.

On either side, in alcoves formed by the usual wooden pillars, are cabinets for the display of ancient arms. The five cabinets in the west alcoves are each equipped with two 25-candlepower carbon-filament lamps installed in square corrugated mirror reflectors located just above the glass top of the cabinets.

The five cabinets in the east alcoves, next the outer wall and the deeply recessed, small window openings, are each provided with one such lamp, likewise reflectored.

In this room there are also two cabinets located against the middle partition and containing a display of ancient saddles, stirrups and spurs. Each cabinet is about 11 feet high, 5 feet broad and 1.5 feet in depth. The contents are lighted by six 20-watt Tubolites in each cabinet, two located at the top facing downwards, and two on each side, just behind the casing of the glass doors. All the lamps are contained in close-fitting metal reflectors, which are set at an angle of 45 degrees from the side walls. The side lamps are respectively 3 and 7 feet above the floor of the cabinet, which is about nine inches above the floor of the room.

The Chapel of St. John, which is entered by a short flight of stone steps from the south end of this room, is beautifully lighted with a 20-watt tubular lamp on each of the outer corners of the capitals of the pillars that encircle the nave and form an aisle completely around it, and by a line of similar lights installed directly on the floor of the clerestory above the aisle. The lamps in all cases are contained in narrow metal reflectors, which throw the light outward onto the outer walls and upwards onto the roof, none of the lamps being visible nor shining in the eyes of the beholder. Shaded strip lights are located over the organ keyboard and the reading desk. The only

visible lighting units are two 30-watt tungsten lamps, which are installed from the central pillars, on the side toward the aisle. These are unshaded, and furnish a general illumination to the floor of the Chapel, which glows throughout its interior with the rays from the concealed units as they shine upon the gray walls of this notable example of Norman architecture.

Coming next to the Horse Armory, a hall directly above the Grand Banqueting Hall and having practically the same dimensions as that, one finds the installation consisting principally of twelve chandeliers, each composed of three 50-watt lamps shaded by a bronzed porcelain shade of the type used in the hall below, in this case the groups being pendent by iron chains about 10 feet below the ceiling and 12 feet above the floor.

Of the 12 groupings, four are spaced in rectangular fashion at equal intervals of about 16 feet, at either end of the hall, and the other four, these unshaded, are located in a square of which the sides are about 12 feet, over the central figure of the collection, a horse and rider, both in full armor of the Sixteenth Century.

In addition to this efficient illumination, there is a 100-watt lamp installed close to the ceiling with a glass reflector, which is directed upon the horse's head and the gleaming armor below.

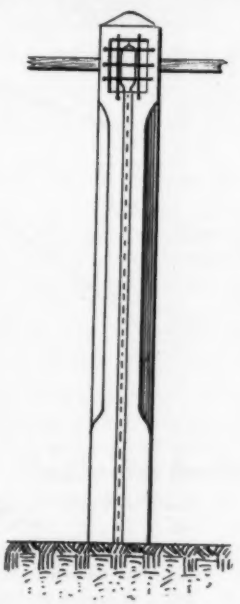
The iron conduits containing the conductor are run along the upper part of the central partition and are painted a dull red. Eight parallel leads enter through the arched doorway into the second Horse Armory room, just east of the first, and directly over the Lesser Banqueting Hall, already described.

Here are four chandeliers pendent from the ceiling on iron chains, about 14 feet above the floor and 8 feet below the roof. Each of these groups consists of three 50-watt Ediswan units. The four groups, which are shaded with the bronzed, leaf-shaped reflectors, are located about 14 feet apart laterally, two at each end of the hall.

Over the center of the room, and lighting specially a large glass case containing oriental small arms and powder flasks, is a five-sided iron chandelier, of the castellated pattern, already described, bearing two pairs of 55-watt and three pairs of 40-watt tungsten lamps—ten lamps in all—each pair being installed at one of the corners of the chandeliers, on three-inch centers. This group of units shines directly into the glass top of the cabinet four feet below.

The four halls described, and the Chapel of St. John, comprise the present show rooms of the White Tower, but the lower floor, containing the dungeon, is being put in order for public exhibition in a few months. The custodians' quarters, the spiral staircases and the long, devious, and otherwise "creepy" passages that connect the various rooms of this old Norman keep are provided with 30-watt units, which sufficiently illuminate the darkness of places which witnessed bloody deeds in the past.

The main switchboard for the building is located in the entry way at the north entrance, and the secondary switchboard for the various public rooms and the Chapel, the passage ways and private quarters, is on the top floor, in the Lesser Horse Armory, near the custodian's office, and is shielded from public view by a group



Lamp Installed in Face of Post, Beauchamp Tower.

of knights of the Middle Ages in ancient armor.

The equipment consists of 44 snap switches, 32 of them for circuits in service and 12 for reserve, installed on a white variegated-marble panel, 2 feet wide by 4 feet high, the switches being in rows of four widthwise. Those in use are labeled with black-lettered ivory labels. The frame is of metal and the door of glass, set in a metal frame. Directly beside the switchbox is the fuse box, of equivalent construction and the same dimensions as the other.

Whenever weather conditions demand a partial illumination of the Armories, the control of circuits will allow the various lines or groupings of lamps, and individual chandeliers, to be operated independently of the rest. On days of moderate darkness, or toward closing time (six o'clock in summer and five in winter) on cloudy or smoky days, the units farthest from the windows are operated, together with those which light cases and cabinets. On days of intense fog and rain, however, the museum requires the utilization of the entire equipment.

Across "Tower Green," now a cobble-paved parade ground, is Beauchamp Tower, once the prison of Lady Jane Grey and other notables. Mounting a spiral stone staircase, deeply worn by the feet of a score of generations, the visitor enters the cell in which the prisoners were kept—a hexagonal room about twenty feet across.

Here, on account of the smallness and the deeply recessed character of the window, owing to the thickness of the wall, a constant artificial illumination is needed, and this consists of twelve 25-watt Ediswan strip lights, of long, slender pattern, each with white-painted metal reflector, and set deep in a cavity excavated in the top of the wooden posts that support the iron railing which runs around the six sides of the irregular-shaped room and keeps visitors at a distance of about 2.5 feet from the walls, which are carved with initials, inscriptions and drawings, done in the soft stone by the one-time prisoners.

The lamps are covered with wide-meshed wire grating, and shining as they do directly on the carvings on the walls, give excellent opportunity for their inspection. Two of the concealed units are in the posts on either side of the table containing guide-books, pictures and postcards offered for sale, and in charge of one of the "beefeaters" or wardens of the Tower.

The character of the whole installation in this room is so cleverly and subtly contrived that the historically-absorbed visitor will scarcely note the source from which the mellow light is shed on the mural decorations.

The 30-watt units that light the staircase and passage in this tower are shaded with frosted-glass reflectors, while those in like service in the White Tower are unshaded.

The last, and perhaps most engaging of the lighting studies in the Tower of London, is now directed to the Regalia Room, which occupies a central apartment of the Wakefield Tower. Here, in an octagonal glass case, which is inclosed in a steel and iron-barred cage, and guarded by a half-dozen keen-eyed officials, are exhibited the Crown Jewels of the Kingdom of Great Britain and the Empire of India.

The inner case is of glass set in a metal framework, the dimensions approximately 10 feet across, 12 feet in height, and the glass roof, crowning

the converging sides, 4 feet in diameter. The outer cage is about two feet larger than the inner case, the shape being the same.

The lighting equipment is the result of long study on the part of the electrical engineers of His Majesty's Engineering Department, Office of Works, of which E. H. Fennemore is the present chief. The immense value and importance of the subject was a stimulus to the work of installing the most efficient lighting provision, which the absence of natural light in the Tower makes imperative.

Around the flat top of the glass case and just within the radius of the metal framework, are installed horizontally eight pairs of 20-watt Mazdalites, arranged two in series, each pair in a trough-shaped, corrugated mirror reflector, the corrugations being vertical. The reflectors are held on brackets, and are directly above the glass top of the case. Forming a continuous row around the thirty-two feet of circumference, the lights deflected downward illuminate the whole area of the collection of crowns, plate, scepters, swords and jewels, which form a pyramid of splendor below. The regalia is arranged in such a manner as to give the beholder the full view of each of the jeweled objects as they rise, one tier upon another to the top, on which stands the splendid royal crown of the reigning monarch, George V.

In addition to the horizontal lamps, at a distance of about twelve inches from the sides of the glass case, and attached to the inner sides of the steel cage, are installed, at the height of about eight feet from the floor, four 60-watt metal-filament lamps, one at each of the four points of compass, with channel-shaped metal reflector, white inside and facing inwards. The lamps are of ground glass, and are located just opposite the framework which forms the angle at the top of the horizontal sides.

Cabinets and wall-cases in the window recesses of the Crown Jewel Room are lighted by horizontal strip lights, installed in pairs in close mirror reflectors held by brackets over the cases containing jeweled swords, trumpets, badges of the orders of knighthood, and other insignia.

The entrance staircase and passageway leading to the Regalia Room are lighted by the usual 30-watt tungsten lamps.

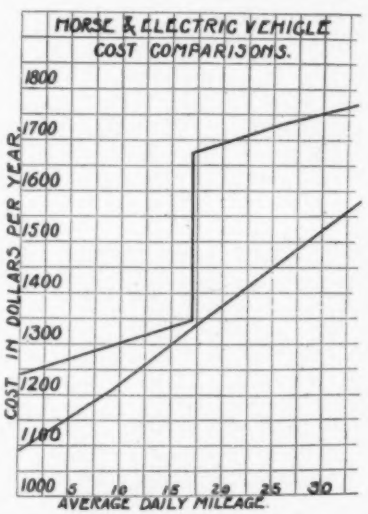
The porters' lodges in the gates of the entrance are equipped with chandeliers of modern brass design, on which are installed five 35-watt units.

Formerly the Tower buildings were lighted by gas, and at a later time an installation of arc lamps was operated in the armories.

The Electric Commercial Vehicle Versus the Horse.

In the last issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, an article by Charles A. Ward, entitled "The Electric Commercial Vehicle Versus the Horse," presented some very interesting and useful figures relating to a comparison of electric vehicle expense in two plants and the expense for similar service with horse-drawn vehicles. A chart was also presented, which is reproduced herewith, showing some horse and electric vehicle comparisons. The following data is an amplification of the tables and information given in the previous article. Mr. Ward continues as follows:

But, you say, and your question is a fair one, where are the figures from which the above were compiled, and in answer to this let me show you Table No. IV having 10 columns of figures.



Horse and Electric Vehicle Comparisons.

Column No. 1 contains all the horse-vehicle costs (and in this particular comparison driver's wages have been included) for a single horse and wagon when standing idle but ready to do service. Column No. 2 contains similarly all the fixed operating and maintenance charges for the electric vehicle when it is also standing idle. The totals of each column are then used to get the first points respectively for the horse vehicle and electric vehicle cost curves and shown on the curve sheet previously referred to. As above stated, the mileage radius in the first case is zero, or in other words both horse and electric are standing idle. Before leaving column No. 2 let me call your attention to this fact; namely, that I have charged against the electric $22 for tires, assuming that these will actually be worthless in four years even though they are not operated a single mile. Similarly, I have charged against the battery item a figure of $50 annually for nothing more than gradual depreciation due almost entirely to age.

Points 3 and 4 were then taken at 8.5 miles on account of their being half way between the zero limit and the maximum limit of 17 miles for the single horse wagon. Obviously the remaining points were taken at 17 miles, 25.5 miles and 34 miles per day.

For convenience all the way through, the so-called garage charge and the stable charge have been apportioned largely on the basis of a square foot charge, although I have actually obtained figures from livery stables in New York based on storing and washing an electric vehicle in service as low as $7 per month exclusive of adjustments and current, while the maximum figure quoted was only $10 per month for the same service.

Let me also state these figures were obtained from livery stables where $30 per month was charged for storing a single horse wagon and storing and feeding the horse. Please note also the cost figures under the heading of "Extra Horse" in the last column and the total of which cost figures, $328 was used when the horse vehicle curve on sheet No. 3 took the sudden jump after the 17-mile limit was reached.

Horse-Vehicle and Electric-Vehicle Comparison.
0 to 34 miles.

Column No.	1	2	3	4	5	6	7	8	9	10	Extra Horse
Capacity 100 pounds	H	E	H	E	H	E	H	E	H	E	
Radius	0	0	8½	8½	17	17	25½	25½	34	34	...
Speed	6	10	..	..	..	..	..	..	..	..	...
Price	$650	$1650									
Repairs and paint	...	...	$ 32	$ 41	$ 65	$ 82	$ 97	$123	$130	$165	...
Shoes and vet.	25	...	35	...	45	...	80	...	90	...	25
Tires (4 years)	...	22	...	38	...	54	...	70	...	86	...
Battery (6 years)	...	50	...	75	...	100	...	125	...	149	...
Current	...	12	...	35	...	70	...	105	...	140	...
Feed and bedding	180	...	200	...	220	...	420	...	440	...	180
Garage	...	80	...	90	...	100	...	110	...	120	...
Stable	180	...	180	...	180	...	270	...	270	...	90
Driver	750	750	750	750	750	750	750	750	750	750	...
Depreciation	65	127	65	127	65	127	90	127	90	127	25
Interest	20	50	20	50	20	50	27	50	27	50	8
Insurance (Fire and liab.)	...	...	...	...	...	...	...	...	...	...	...
Total	$1220	$1091	$1282	$1206	$1345	$1333	$1734	$1460	$1777	$1587	328
Extra horse	...	...	...	...	328	...	...	...	...	...	...
Total—											
Two horses	...	...	...	...	...	...	...	...	...	...	...
One wagon	...	...	...	...	1673	...	...	...	...	...	...

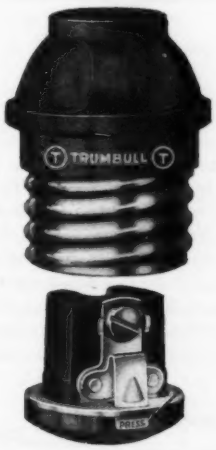
"H" = Horse. "E" = Electric.

New Electrical and Mechanical Appliances

New Trumbull Swivel Attachment Plug.

The Trumbull Electric Manufacturing Company, Plainville, Conn., exhibited a new type of swivel attachment plug, at the National Electrical Contractors' Convention in Detroit, July 14 to 18. This device, which will soon be placed on the market, is shown in the accompanying illustrations.

As can be seen from the illustrations. this plug is provided with a catch, the simple pressing of which causes the bottom of the plug to drop out, thus opening the plug. This catch also serves as a



Trumbull Swivel Attachment Plug—Open.

lock to keep the plug in the assembled condition.

One of the unique features of this plug is the ease with which it can be wired. Ample space is provided for this purpose and there is no necessity for passing wires through extremely small holes or twisting them about corners. Nothing is pinched and the wires are not twisted inside of the plug.

Anticipating the fact that in time the National Board of Fire Underwriters may require fire-proof material to be used throughout, the company selected fire-proof material for all parts of these plugs. Flame has no effect upon any of the material used in these plugs, whereas the materials commonly used in plugs will often soften and melt under the heat of a match.

The salient points of this plug are hence the ease with which it may be

Trumbull Attachment Plug—Assembled.

opened, its fire-proof construction, and the ease with which it can be wired.

New Direct-Current Portable Meters.

A new line of five-inch-diameter direct-current portable ammeters, voltmeters and millivoltmeters, known as the type PW, has just been put on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

These instruments are direct-reading and suitable for battery testing, signal work, and all purposes where an instrument of pocket size is desirable. They are particularly adapted to testing electric lighting and starting equipments of automobiles. They operate on the d'Arsonval principle having a moving coil and a permanent magnet, and are free from residual errors.

The complete movement is mounted as a unit. A unique feature is the arrangement of the moving element, which can be readily removed by taking off the cover and removing the two screws on the side pole-piece support. The entire moving element and the bearings can then be lifted out as a unit and can be replaced in exact position. This makes repairing possible without disturbing the alinement of the magnetic circuit.

Fig. 1.—Portable Direct-Current Meter.

Owing to the use of an aluminum pointer, a light counterweight is sufficient, resulting in a light-weight movement and small wear on the pivot jewels. The high torque in proportion to the light weight of the moving element insures great accuracy, considering size. The meter will withstand shocks such as it will be subjected to in ordinary use, without affecting the accuracy.

The light metal frame on which the moving coil is wound moves through

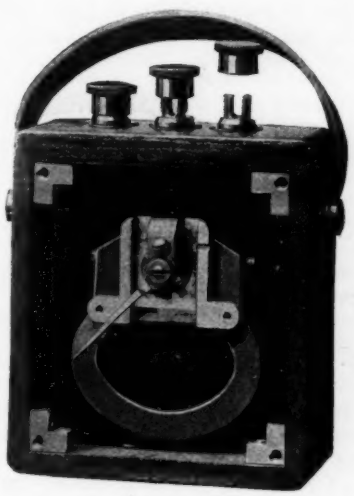


Fig. 2.—Mechanism of New Meter.

the air-gap of the strong magnet and makes the reading inherently dead-beat. This very important feature enables readings to be taken quickly, and prevents violent fluctuations from injuring the pointer or the moving element.

The scale is made of metal and subtends an arc of 90 degrees, giving large open divisions which are uniform throughout. The full length of the pointer shows on the dial, thus making the meter easy to read. Each meter is mounted in a n. rocco case.

A new feature has been used on the meter terminals. The terminal stud has a U-shaped groove (see Fig. 2) into which the wire lead is inserted. The thumb-nut then screws down on the lead, gripping it in close contact between the thumb-nut and the two sides of the groove.

Test of Insulating Compound.

The Union Clay Products Company, New Brunswick, N. J., is the manufacturer of G-K insulating compound, which is recommended for conduit. This compound is made of raw linseed oil, sulphur, resin and anhydrous clay. The finished product is a heavy homogenous mass weighing 94 pounds per cubic foot and extremely plastic. It becomes plastic at about 180 degrees Fahrenheit. It is unaffected by acids and alkalis.

An insulation test of this material was recently made by the Electrical Testing Laboratories, Inc., New York City, the material being molded in a rectangular box containing two parallel wires 0.5 inch apart. The voltage was applied to the two wires and raised gradually until puncture occurred. The compound punctured after an application of 81,400 volts for 70 seconds.

Stripping Pliers.

Of considerable interest to electricians is the new wire-stripping plier that has been added to the extensive Red Devil family. This is for use on

Red Devil Stripping Pliers.

cloth or silk-covered wires of fine gauge such as Nos. 18, 20 and 22.

As can be seen from the illustration, the new stripping plier is modeled along the lines of the popular electrician's diagonal plier and the stripping feature has been placed in the cutting edges in such a position as not to interfere with wire cutting.

The new tool has hand-honed cutting and stripping edges and is packed with the regular two-year insurance bond that accompanies all Red Devil "Bonded" tools.

The new tool is known as No. 1742 and the manufacturer, Smith & Hemenway Company, Incorporated, 150 Chambers Street, New York City, will be pleased to furnish further information and prices to all interested.

Safety Fuse and Cutout Switch.

The ELECTRICAL REVIEW AND WESTERN ELECTRICIAN recently performed a test on a model of an interesting cutout switch which is the invention of Louis Kovacs, 317 South Peoria Street, Chicago, Ill. This switch and a safety fuse were fully described on page 652 of our issue for March 29, 1913. The switch is a combined switch and fuse, the cartridge-fuse elements taking the place of the usual knife blades. Both the safety fuse and the cutout switch are so designed that it is impossible to assemble them with parts that do not correspond in current rating and it is only with extreme difficulty that the fuse wire can be placed and a seal may be placed on the cartridge in such a manner that the cutout cannot be tampered with without breaking the seal. Both devices are intended to be made with fireproof materials and an asbestos cylinder forms the inside of the cartridge of the cutout switch.

The object of the test which was recently performed in the Haymarket Theater Building, Chicago, Ill., was to determine the maximum temperature to which a spring on the interior of the cutout switch would be subjected, it being important that the spring retain its tension as it supplies the necessary pressure between two interior current-carrying contacts.

The model of the cutout switch that was tested was designed for a 300-ampere rating, but the regular fuse wire was replaced with a copper one requiring 333 amperes to melt. A current of 325 amperes at 115 volts, direct current was caused to flow through the switch for two hours. The temperature of the hottest part of the cutout switch was found to be 165 degrees Fahrenheit at the end of the test, a temperature that would in no way affect the temperature of the spring. The room temperature was 85 degrees.

The device was afterwards taken apart by the inventor for demonstration purposes. The inventor has expressed his willingness to demonstrate the device before interested parties and hopes soon to have commercial samples ready for testing by the Underwriters' Laboratories. American, Canadian, and British patents protect the device.

This device and the inventor's plug fuse are capable of doing much to prevent the overloading of electrical circuits by the substitution of fuses of higher capacity than specified.

Simplex Ranges in High School.

The Board of Education of Salt Lake City, Utah, has awarded to the Inter-Mountain Electric Company the contract for the electrical cooking equipment for the cafeteria for the new East Side High School which is nearing completion and will be placed in service at the beginning of the next school year.

The equipment will consist of two No. 14 Simplex ranges, one of them to have two 15-inch disks, and the other to have one 10-inch disk, one 12-inch disk, two 8-inch disks, and two 6-inch disks, with a complete line of lock-on cooking utensils to fit the various disks.

In order to accommodate the large amount of baking necessary an additional baking oven will be furnished. Also a three-gallon chocolate urn and a six-foot electrically heated steam table, all made by the Simplex Electric Heating Company, of Cambridge, Mass. The equipment is intended to be adequate to serve 800 pupils with luncheon.

New Push-Button Tool-Handle Switch.

The increasing development and use of portable electrical devices has caused a demand for switches that may be so installed as to give most convenient control. With some devices the cord switch is well adapted but for those

Push-Button Tool-Handle Switch.

tools or devices having handles it has been sometimes found more practicable to place the switch in the handle itself rather than on the cord. The portable vacuum cleaner is an example of the type of device to which the new tool-handle switch made by The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has been successfully applied. This switch has a high-capacity quick-make-and-break mechanism inclosed in a fiber cylinder ready for installing in

Switch on Handle of Tool.

the handle. The outside diameter of this fiber cylinder is only one inch. Extra strong light and dark indicating push-buttons are used and accessible terminals are located on one side of an insulating wall which separates them from the mechanism. Since this switch becomes a part of the device it controls, the Underwriters Laboratories' approval is secured with the device and not separately, but the mechanism is the same as is approved for 660 and 750 watts in other swtches of Cutler-Hammer make.

A new and large central station is to be built for the municipal electric works of the city of Vienna, Austria. The estimated cost is about $3,200,000. Information may be obtained by writing, in German, to the Gemeinderat der Stadt Wien.

Chicago Office of Jefferson Glass Company.

View of Office from Main Entrance.

New Chicago Office and Show Room of Jefferson Glass Company.

The Jefferson Glass Company of Follansbee, W. Va., recently opened an office and show room in Chicago which is somewhat of a departure from the ordinary, especially in the matter of decorative treatment. The character of the approach to the eighth floor suite occupied by this company, as seen from the elevators, is symbolic of the practical decorative treatment exercised throughout their rooms, which are in the Michigan Boulevard Building.

A modest display of handsome illuminating glassware of Jefferson manufacture has been arranged inside of the transoms, which viewed also from the corridors, tells the story in a novel but refined manner. Of course, the name of the company appears in thin line Gothic characters on the four doors, but the prismatic glass panels in the doors in question have been screened with cream-colored linen to prevent the possibility of a glare, which would naturally impair the quiet dignity of the general exterior plan.

In the office the walls are tinted with buff surmounted with a cream-colored ceiling from which are hung, in artistic zig-zag style, various creations of unusual types of illuminating glassware for commercial usage.

The walls are relieved by special prints of the McAlpin Hotel, New York, the Michigan Boulevard Building, Chicago, and other modern buildings where glassware made by the Jefferson Glass Company has been installed. These pictures have been carefully framed in fumed oak and give an animated appearance to the room.

The rugs are in two-toned brown mottled in tan and form an admirable foundation for the white oak furnishings, desks, files, and special large tables for the perusal of building and engineering blue-prints, plans, etc.

Entrance to the show room is effected through a low diagonal opening doubly draped with velours to harmonize with both interiors, giving the effect of a panel in the wall. This arrangement not only prepares one for the style of interior treatment in the showroom but absolutely prevents the transmission of sound between the rooms.

The general architecture and decorative plan of this room is French Gothic, being the style best adaptable for severe utilitarianism. The fact that thousands of individual specimens of illuminating and other glassware representing the comprehensive products of the Jefferson Glass Company are given proper space in accordance with their respective styles, characters, shapes, sizes, etc., made it necessary to develop a unique structural arrangement as well as color scheme, and as a consequence the room is firm-spirited and rational.

The walls are tinted with a mottled treatment of old wine colors, surmounted by a ceiling of pearl lustre, from which handsome bowls, cones, lanterns and other lighting effects representing the results of the efforts of artists and designers of international reputation are suspended by appro-

Section of Display Room.

Opposite View of Display Room.

priate fixtures, finished in dull silver.

The woodwork is stained maple finish with silver grey French enamel, which is extremely pleasing and signifies a radical departure from the funeral effect produced by the use in general of black and green in showrooms for this purpose. It also proves the power of color to counteract weight in effect, since, notwithstanding the fact it was necessary to run the shelving to the ceilings, the whole cabinet plan really resembles well selected side-boards and china-closets rather than solid, permanent equipment.

The windows are draped with silk velour hangings and valances of rich mulberry bound with antique silver trimmings, twelfth century style. The doors and transoms are dressed with puffed curtains, embroidered with silver applique of the same Northern French Gothic period.

Splendid Academy subjects grace the walls, including "The Broken Pitcher," "The Lady of the Empire," "The Landing Place," reproduced by the Bodlian Society and framed in African mahogany.

The radiators have been successfully boxed and made to form window seats, while between the two windows stands a seven-light candelabra, in French Gothic design, as a reminder of the time in French history when all learning and great wealth was in the hands of the ecclesiastics.

In the center of this room is a pyramid circular in form, with three tiers built round a Corinthian column of Jefferson Doric glass. The arrangement of the many patterns and types of glassware on this stand is seen in the accompanying illustrations.

The Chicago office is under the management of A. W. Boulton.

New Westinghouse Electric Crane Controllers.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently put on the market a new line of magnetic-switch crane controllers. This line is complete and includes the following controllers for single motors or for the motors in series or in parallel: (1) trolley; (2) bridge, with or without speed control; (3) hoist, with or without speed control and dynamic braking.

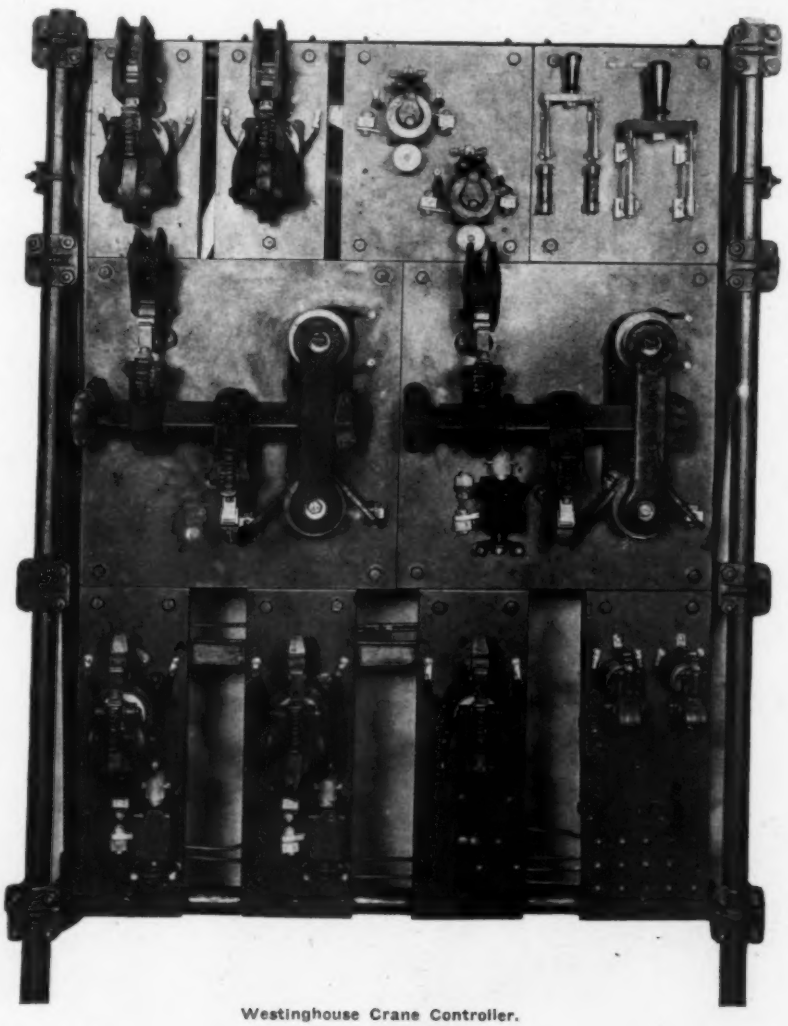
Dynamic braking is very desirable for hoist operation because it gives the operator complete control over the load. He can hoist or lower at high speed and stop instantly with no over run, and he can "inch" the load with precision.

These controllers are characterized by reliability, durability, and simplicity. The maget-switch contacts cannot stick together. The parts are few in number and all are strong and substantial. The number of interlocks, with their multiplicity of contacts and complicated connections, is reduced to a minimum. Inspection and repair of wearing parts can be easily made so that time lost on account of controller repairs is negligible. Each switch is mounted on an individual slate base and the whole assembly is mounted in a very substantial manner on a pipe framework.

Overload protection is provided for by means of two overload relays (one in each side of the line). After the relays have operated, they are automatically reset by bringing the master switch to the "off" position. Since these relays open both sides of the line, failure of operation due to grounded wires is made impossible.

The no-voltage release opens the control circuit on failures of the supply voltage and the motor cannot be started again until the master switch is returned to the "off" position.

In order to secure safety during inspection and repair of crane apparatus, a device for locking the main line switch is employed. The switch is locked open when the safety key is removed and cannot be closed until the latter is replaced. Several holes are provided for padlocks, which may be inserted by men working independently on the apparatus and prevent the insertion of the safety key as long as they remain in place.



Westinghouse Crane Controller.

A Novel Lighting Effect.

A few years ago some one hit upon the idea of illuminating the cornice of a building at night. The effect was unique and met with favor. Since that time these installations have increased in number, but the methods of illumination have been, up to the present, surprisingly crude in most instances. In one very prominent hotel tungsten lamps in ordinary white-enameled tin-cone reflectors have been strung along every few feet. And this is a common practice. The result is that, from a distance, there is a

twinkle of lights with dark spaces between.

The Baird Building, in Omaha, Neb., is a pleasant exception to the former rule. The architect, Thomas Kimball Company, of Omaha, used special cove lighting, adopting the Frink and J-M Linolite system made by the H. W. Johns-Manville Company.

Continuous cornice reflectors, 306 feet long, were installed, using Linolite tungsten lamps. These lamps are one foot in length and form a continuous "line of light" when joined end to end. In order to protect the reflector from dust, snow, etc., a glass shield or cover was added. The effect secured is that of a brilliant white band encircling the building. Neither a shadow nor a lamp filament is visible and the way in which the building stands out from all others at night is surprising. It has attracted much favorable comment and will serve as a pioneer in this new field of outdoor lighting. The architectural details are brought out with remarkable clearness, an accomplishment which has been practically impossible heretofore.

Canopy Plug Receptacle and Plug Adapter.

The necessity for a convenient and

Fig. 1.—Canopy Plug Receptacle.

neat appearing device for attaching heating devices, portable lamps, etc., to a wall bracket fixture has long been

Fig. 2.—Receptacle Attached to Bracket Fixture.

felt. Fig. 1 shows a device which fulfills this need, while Fig. 2 shows the device attached to a bracket fixture. As can be seen the device consists of a plug receptacle mounted on a porcelain base which is designed to be fitted in an opening cut at the bottom edge of the fixture canopy. The receptacle is furnished in any style of brass to match the fixture canopy and when attached to a fixture the whole presents a very pleasing appearance. The cord leading to a portable lamp or other device can be plugged into the receptacle, thus eliminating the necessity for removing lamp bulbs from the fixture. The device is easily wired and can be installed without any dirt.

Fig. 3 shows a convenient adapter for lamp receptacles, the adapter being designed to be screwed into an Edison-base receptacle as shown in Fig. 4. This device permits any device to be readily plugged into the receptacle and eliminates the time required to screw in an Edison plug whenever a connection is desired. This adapter is so designed that it can be permanently left in the receptacle, the adapter being short enough to permit the receptacle door to close.

These devices are manufactured by the H. T. Paiste Company, Philadelphia, Pa.

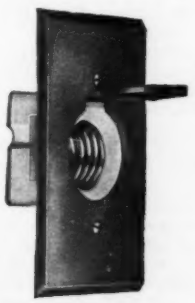


Fig. 3.—Adapter and Wall Receptacle.

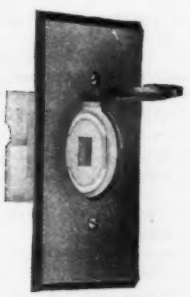


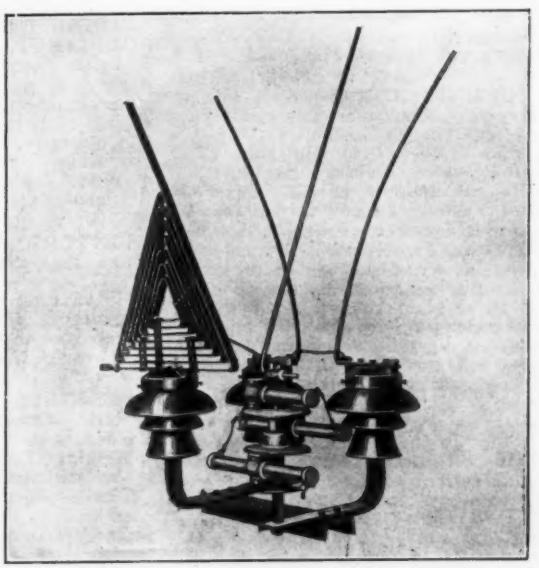
Fig. 4.—Applied to Edison-base Receptacle.

Horn-Gap Arrester with Resistance.

To meet the demand for a lightning arrester embodying all of the characteristics of the Burke series horn-gap arrester, but with a resistance in the ground circuit of each phase, the Railway and Industrial Engineering Company, of Pittsburgh, Pa., has placed on the market the protective equipment illustrated herewith. The arrester consists principally of a triangular choke coil wound with strap copper and a ground horn mounted on a special post-type insulator, which supports and insulates from each other and the ground the resistance units, as can be seen in the illustration.

In the design of the arrester, the two factors which cause a surge to arc to ground are concentrated at one point, that is, an efficient obstruction in the form of the triangular choke coil, and a point of weak resistance to ground in the form of the horn gap. A surge meets its first obstruction at the first sharp turn of the choke coil, opposite which point is mounted the grounded horn. Due to this construction the gap to ground may be set fifty per cent greater than the ordinary shunted horn gap and the same protection obtained.

The resistance is of such value as to limit the flow of dynamic current to approximately ten amperes, should two or more phases discharge simultaneously. It is inserted in the ground circuit of each phase, and is composed of Koppat. This resistance material is extremely strong mechanically and possesses electrical characteristics which make it particularly adaptable to this service. It has a very low positive temperature-coefficient of resistance, conducts current uniformly throughout its entire mass, and is not affected by high-frequency discharges. These resistance columns are so constructed that they may be used in connection with Burke arresters now in service, operating with horns connecting directly to ground.



Burke Horn Gap Arrester.

Telephones in America.

It is estimated that there are in service in the United States about 9,000,000 telephones, which is about two-thirds of the total number of telephones in use throughout the world.

Latest Approved Fittings

ATTACHMENT PLUGS, Fuseless.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant."

660 watts, 250 volts; catalog Nos. 499, 1948.

Approved July 2, 1914.

AUTO STARTERS.—Lincoln Electric Company, Thirty-eighth Street and Kelley Avenue, Cleveland, O.

"Lincoln" compensator starters for alternating-current motors, 5 to 125 horsepower, 220, 440 and 550 volts.

Oil-immersed switches and transformer coils. In the "off" position the switches disconnect the motor and transformer windings from the line.

Approved July 11, 1914.

CABINETS.—D. & W. Fuse Company, Providence, R. I.

"D. & W." fuse boxes. Cast-iron boxes containing two or three-pole porcelain or slate cutout bases for National Electrical Code standard cartridge inclosed fuses.

"Waterproof" style, 0-600 ampere. 250 volts; catalog Nos. 2,000-2,211, inclusive, 0-400 amperes, 660 volts, catalog Nos. 1831-1835 inclusive, and 1837-1841 inclusive.

Approved June 30, 1914.

CONDUIT BOXES.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

"Pipe Taplets," catalog Nos. 4226-4228 inclusive. Fittings designed for adding branch circuits at outlets of "Pipe Taplets" already in use without the necessity of removing the original installation or of cutting the conduit.

The indiscriminate use of these devices affords a ready means of overloading existing circuits already wired to the limit of safe carrying capacity, and care must be taken not to apply these fittings where their use would be improper or violate the rules of the Code.

Standard for exposed work only.

"Pipe Taplets." Cast-iron conduit boxes with threaded openings for standard sizes of rigid conduit.

Square-box types A, B, C, D, E, LB, LF, LL, LR, T, U and X. Catalog Nos. 4115, 4125, 4135 and 4170, for use with special porcelain covers or with suitably approved rosettes or receptacles; also switch fittings, catalog Nos. 5263-64-68.

Type SS, pipe elbows, for use only with 0.5-inch and 0.75-inch conduit.

Type SE, for use with 0.5-inch to four-inch rigid conduit.

Special fittings, catalog Nos. 5354-56-97.

Branch block, type Special T, consisting of a base with line and branch terminals and an inclosing box.

Round-box types G, GG, GT, H, W, WC and WT.

Standard for exposed work only.

Approved June 30, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—Chase-Shawmutt Company, Newburyport, Mass.

"Chase" nipple for rigid unlined conduit.

Approved July 7, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Couplings and connectors for armored cable, catalog Nos. 2208-11 inclusive.

Approved June 29, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

Service-entrance caps, type FH, consisting of hoods provided with porcelain plates forming wire bushings and provisions for attachment to conduit or pipe "Taplets."

Approved June 30, 1914.

FIXTURE STEMS. — Pittsburgh Valve & Fittings Company, Barberton, O.

"P" fixture stems; made of malleable iron, galvanized, for use with three-eighth-inch couplings, etc.

Approved June 30, 1914.

FLEXIBLE CORD. — Northern Electric Company, Ltd., Montreal, Canada.

Marking: Two yellow threads cabled with copper strands.

Flexible cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to coils.

Approved July 9, 1914.

FLEXIBLE CORD, Portable, for Electric Heaters.—Northern Electric Company, Ltd., Montreal, Canada.

Multiple cords composed of loosely twisted wires with cotton wind, rubber and asbestos insulation covered with an open retaining braid and assembled as a twisted pair with an outside protecting braid over the whole.

Tag on coil to read: "National Electrical Code Standard."

Marking: Two yellow threads cabled with copper strands.

Approved July 9, 1914.

LIGHTNING RODS.—W. C. Shinn, Lincoln, Neb.

"Shine System" of lightning protection for buildings.

In this system woven copper cables and copper tubing are used, having a weight not less than three ounces per foot, and intended for the protection of residences, barns, stores and similar buildings where the maximum height of any point does not exceed 60 feet and where corrosion is not liable to occur to any extent.

Installations of this system are to be made by men in the employ of the manufacturer, and should in all cases be made in conformity with the "Suggestions of the National Board of Fire Underwriters for Protection Against Lightning as recommended by the National Fire Protection Association," Edition 1913.

Approved July 11, 1914.

MOLDING FITTINGS.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Fittings for use with "National" metal molding.

Outlet bushings: Catalog Nos. 433, 2220-A.

Flush switch adapters; catalog Nos. 442-46 inclusive.

Approved June 30, 1914.

PANELBOARDS.—Sterling Switchboard Company, 537-545 South Seventh Street, Camden, N. J.

Two-wire, 125 and 250 volts, and three-wire, 125-250 volts, with or without main-line and branch-circuit switches, and with National Electrical Code cartridge inclosed, Edison plug or open-link fuse extensions in branch circuits.

Commercial products of this class which are regularly examined and tested under the supervision of Underwriters' Laboratories at the factories where they are produced bear uniform labels by which they can be identified in the field. See lists and cards covering products which are so labeled.

Approved June 1, 1914.

RECEPTACLES, Standard.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

Rosette receptacles mounted on link-fuse rosette bases, two amperes, 125 volts.

Brass-shell.

Key, catalog Nos. 5809-10.

Keyless, catalog Nos. 5813-14, 9436.

Also above with shadeholders attached.

Approved June 29, 1914.

RECEPTACLES, Standard.—Arrow Electric Company, Hartford, Conn.

"Arrow E" receptacles and wall sockets.
Porcelain-shell, keyless, 660 watts, 250 volts.
Sign, catalog Nos. 4000, 4001, 4002.
Approved July 11, 1914.

RECEPTACLES, Standard.—General Electric Company, Schenectady, N. Y.
Keyless, 660 watts, 250 volts.
Back-connected receptacles, catalog Nos. 24998, with removable ring; GE550, with fiber-lined shell.
For use only on switchboards.
Approved June 30, 1914.

RECEPTACLES, Standard.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.
"Paiste" brass-shell wall sockets.
Key, catalog Nos. 4537-46-55-64-73-82-91, 5626-35-44, 5800, 50,753, 60,018.
Keyless, catalog Nos. 5438-47-56-65-74-83-92, 5635-45, 5801, 50,717-18-55, 60,020.
Pull, catalog Nos. 5439-48-57-66-75-84-93, 5802.
Approved June 29, 1914.

RECEPTACLES, Weatherproof.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.
"Paiste" 660 watts, 600 volts.
Conduit-box, catalog No. 5293.
Cleat, catalog No. 9000.
Approved June 29, 1914.

RECEPTACLES, Weatherproof.—Harvey Hubbell, Incorporated, Bridgeport, Conn.
Weatherproof receptacle for street hoods, catalog No. 122.
Approved June 15, 1914.

ROSETTES, Fuseless. — National Metal Molding Company, Fulton Building, Pittsburgh, Pa.
Catalog No. 432.
For use with metal molding, catalog Nos. 348, 430, 431.
Approved June 30, 1914.

ROSETTES, Fuseless. — H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.
"H. T. P. Company," three amperes, 250 volts.
Concealed, catalog No. 484.
Approved June 29, 1914.

SOCKETS, Standard. — Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.
"Benjamin" brass-shell.
Keyless, porcelain-lined, mogul base, 660 watts, 600 volts, for use with incandescent lamps in series on 600-volt circuits, catalog No. 4210.
Approved June 9, 1914.

SIGNS, Electric.—Elbright Company of America, 133 West Twenty-fourth Street, New York, N. Y.
"Elbright" system of decorative lighting.
For temporary work only.
Approved June 23, 1914.

SIGNS, ELECTRIC.—The Commercial Electric Company, Limited, 728-730 Poydras Street, New Orleans, La.
Electric signs shown by tests and examinations conducted, by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached like illustration.
Approved June 26, 1914.

SIGNS, Electric.—Thomas Cusack Company of Milwaukee, 1604-12 Clybourn Street, and 332-34 Fourth Street, Milwaukee, Wis.
Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached.
Approved July 6, 1914.

SIGNAL APPLIANCES.—Western Electric Company, 463 West Street, New York, N. Y.
1-A, 1-B, 1-C, 2-A, 2-B "Code Signaling Sets" with "Subscribers Set."
For use only on battery circuits or circuits of not over 30 volts supplied from motor-generator sets to give code signals on systems of bells or buzzers either separately or in connection with telephone systems.
The use of these devices and the circuits for which they are intended is judged to present only such hazards as are involved in other signaling systems deriving their energy from batteries of low voltages. They are not judged to comply with the rules and requirements for manual fire-alarm systems.
Approved June 23, 1914.

SOCKETS, Standard.—Weber Electric Company, Schenectady, N. Y.
Brass-shell electrolier.
Key, 250 watts, 250 volts, catalog Nos. 1000, 1003, 1006, 1009, 1048, 1069, 1090, 1093, 1096, 1099.
Keyless, 660 watts, 250 volts, catalog Nos. 1001, 1004, 1007, 1028, 1049, 1088, 1091, 1094, 1097, 1100, 1168-69, 1188-98 inclusive. Candle socket, No. 1200.
Pull, 250 watts, 250 volts, catalog Nos. 1002, 1005, 1008, 1029, 1089, 1092, 1095, 1098, 1101.
For fixture use only.
Approved June 26, 1914.

SOCKETS, Standard.—Harter Manufacturing Company, 1138 West Austin Avenue, Chicago, Ill.
"Harter," brass-shell, porcelain-lined.
Mogul, catalog No. 112.
Approved July 16, 1914.

SOCKETS, Weatherproof.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.
"Paiste," 660 watts, 600 volts.
Pendant style, composition shell, catalog Nos. 42,686, 43,310.
Bracket style, porcelain shell, catalog Nos. 9448, 9496, 22,755-56.
Approved June 29, 1914.

SOCKETS, Weatherproof.—Pass & Seymour, Solvay, N. Y.
Metal-shell, porcelain-lined, catalog No. 487.
Approved July 11, 1914.

SWITCHES, Automatic.—Automatic Switch Company, New York, N. Y.
"S V R sylphon vaccum-regulating" switch.
A single-pole snap switch connected in series with a motor coupled to a rotary pump for producing vacuum in an "Arco Wand" vacuum-cleaning system and so arranged that when the vacuum falls the switch is automatically closed.
The motor is not to exceed one horse power, 115 volts, or 15 horsepower, 230 volts, alternating or direct current.
Standard when used in connection with a fused double-pole switch.
Approved June 15, 1914.

SWITCHES, Combination Cutout.—Detroit Fuse & Manufacturing Company, Detroit, Mich.
Porcelain-base switches with Edison plug cutouts, 30 amperes 125 volts, catalog Nos. 1402 and 1403.
Approved June 15, 1914.

SWITCHES, Combination Cutout.—D. & W. Fuse Company, Providence, R. I.
"D. & W." fused switch boxes. Cast-iron boxes containing double or triple-pole knife switches and cut-out bases for National Electrical Code standard cartridge inclosed fuses, and having external levers for operating the switches, 0-100 ampere, 250 volts, catalog Nos. 25,075-25,080 inclusive.
Approved June 30, 1914.

SWITCHES, Knife. — Sterling Switchboard Company, Camden, N. J.
Type A (milled clip), all capacities, 125, 250 and 600 volts.
Approved June 1, 1914.

SWITCHES, Pendent. Pass & Seymour, Incorporated, Solvay, N. Y.
Single-pole, three amperes, 250 volts; six amperes, 125 volts, catalog No. 3,-000.
Approved June 23, 1914.

SWITCHES, Surface Snap.—The Arrow Electric Company, 630 Capitol Avenue, Hartford, Conn.
With Metal Covers.
Single-pole, three amperes, 250 volts, five amperes, 125 volts, catalog Nos. 6108-09, 6212-13, 6246-47.
Single-pole, five amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 6204-6207 inclusive.
Double-pole, five amperes, 250 volts, catalog Nos. 6208-6211 inclusive, 6352 and 6353.
Double-pole, 10 amperes, 250 volts, catalog Nos. 6215-6218 inclusive.
Double-pole, 20 amperes, 250 volts catalog Nos. 6210-23 inclusive.
Three-way, one ampere, 250 volts, three amperes, 125 volts, catalog Nos. 6227-28.
Also all the above types with lock attachment.
Approved June 15, 1914.

SWITCH BOXES. — Connecticut Electric Manufacturing Company, Bridgeport, Conn.
Pressed-steel switch boxes for mounting flush switches and receptacles, and having one removable side to facilitate assembly for use in gangs.
Approved June 15, 1914.

SWITCH BOXES.—The Chelton Electric Company, 314 Armat Street, Philadelphia, Pa.
Pressed-steel boxes for mounting flush switches and receptacles.
For rigid conduit, catalog Nos. 6801 and 9900, spacer, catalog No. 9901.
For flexible tubing, catalog Nos. 7801 and 8800, spacers, catalog Nos. 7802 and 8801.
Approved July 11, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

GARDNER, MASS.—The advisability of installing eight poles as an experiment before launching a white way system of lighting to cover every street included in the business district is under consideration by a special lighting committee. The experimental system, it is estimated, will cost $1,000.

WESTFIELD, MASS.—Residents of Little River section have petitionel the Municipal Lighting Commission for an extension of the electric street lighting system in Little River Street.

WESTFIELD, N. Y.—The special election held to determine whether or not the village should spend $7,100 on repairs and improvements to the municipal electric light plant was carried. Address the city clerk for desired information.

BAYONNE, N. J.—The Public Service Electric Company is negotiating with the City Council for the underground installation of its lines in the city. The company has agreed to expend $25,000 on this improvement during the first year, and $10,000 each year thereafter until completed. A.

BORDENTOWN, N. J.—The Board of City Commissioners is considering the installation of a municipal electric lighting plant; the improvement is estimated to cost about $40,000. A.

ELIZABETH, N. J.—The Singer Manufacturing Company will build a new power plant in connection with other extensions at its sewing machine factory. A.

SOUTH AMBOY, N. J.—The Middlesex-Monmouth Light, Heat & Power Company is planning for the erection of a new power line on the county road between Whale Creek and South Amboy. A.

SOUTH ATLANTIC STATES.

CUMBERLAND GAP, VA.—This city is soon to have an electric service supplied by the Kentucky Utilities Company, which has obtained a right of way over the mountains. Contracts have been closed between the two parties. The Lincoln Memorial University near here, also will be electrically supplied by the Kentucky Company. G.

KINGSTON, N. C.—G. C. White, consulting engineer, Charlotte, N. C., has been engaged to supervise improvements to be made to the electric light plant, etc., to cost $100,000.

FLORENCE, S. C.—The Florence Electric & Utility Company is preparing to double its capacity for furnishing light and power.

ATLANTA, GA.—Plans are being prepared and all arrangements completed for the erection of a new power plant here to cost $100,000. Address the city clerk in regard thereto.

PAVO, GA.—Municipal bonds for establishing an electric light plant have been voted. Address the mayor for general information.

DETROIT, FLA.—The Detroit Ice, Light & Power Company has been organized with a capital stock of $25,000 and will establish an ice factory. F. W. Symmes is president and C. F. Keep, secretary.

FORT MEADE, FLA.—On August 21 an election will be held to decide the question of issuing $65,000 in bonds for an electric-light plant. Address the city clerk in regard to this matter.

TAMPA, FLA.—Extension of the "White Way" system on Seventh Avenue is being considered. Address D. B. McKay, mayor, for particulars.

NORTH CENTRAL STATES.

CINCINNATI, O.—The Main Street Merchants' Association is considering plans for the ornamental lighting of that street, proabbly on a co-operative basis, and will shortly take up suggestions as to the best and most effective plan. L.

DAYTON, O.—Joseph R. Gebhart, owner of the old Gebhart mill, has started work upon the conversion of the structure into a four-story power building for use by small manufacturers. A considerable amount of electrical wiring and power equipment will be required in connection with the plan of fitting the several floors for manufacturing purposes. L.

DEFIANCE, O.—The Ridgeville Light & Power Company has been formed here and will operate an electric-lighting line extending from Jewell to Ridgeville.

MASON, O.—The village of Mason has sold electric-light bonds to the amount of $14,000, at a premium of $597, and will shortly proceed to let contracts for the construction of a power plant and distribution system with the proceeds of the sale. L.

EAST GARY, IND.—The Town Board has authorized the issue of $10,000 in bonds for the erection of a transmission and distributing plant, to which the Calumet Electric Company will transmit electric power.

FREDONIA, WIS.—L. H. Schmitz, of Port Washington, contemplates establishing an electric light plant here.

SUPERIOR, WIS.—As a result of negotiations pending between the City Commission and the Superior Water, Light & Power Company, it is probable that 275 additional street lamps will be installed next year.

DODGE CENTER, MINN.—A franchise has been granted a private company for an electric light and power plant. The company is in the market at once for a 50 or 75-kilovolt ampere, three-phase, 60-cycle, either new or second-hand, 2,300-volt alternator. Homer G. Hall is manager and in charge of installation.

HARRIS, IOWA.—The council is considering ways and means to secure electricity from Sibley for street lighting. Address the county clerk in regard to this matter.

WATERLOO, IOWA—Articles of incorporation of the Cedar Valley Power Company have been filed. The company is capitalized for $1,000,000; H. H. Coughland is president; M. A. Harrison, Hampton, vice-president; A. L. Dodd, Charles City, secretary-treasurer.

HOPKINS, MO.—H. A. Dalbey of Grant City has been granted a 99-year lease for the construction of a new electric-light plant here to cost $10,000.

PENBROOK, NEB.—A new system of electric street lighting, to be supplied by the Harrisburg Light & Power Company, will be established here.

LARNED, KANS.—August 14 bids will be received for waterworks improvements and the construction of a municipal light and power plant, to include motor-driven pumps, engines, generators, condensers, boilers, stacks, etc. Worley & Black, Kansas City, Mo., are consulting engineers. Address L. D. Burgess, city clerk.

SOUTH CENTRAL STATES.

DANVILLE, KY.—It is given out here that the Commonwealth Power, Railway & Light Company, which recently purchased the local electric and gas plant from the Danville Gas Company, will remodel the whole plant, with the intention of making it one of the best equipped in the state. Several representatives of the company, F. J. Haas and A. C. Blinn, of Evansville, Ind., and Samuel E. Wolff, of New York, recently spent several days in Danville inspecting the property.

MONTICELLO, KY.—An electric light plant and city lighting system is proposed here, together with a water system. The city will vote on a proposed bond issue at the regular election to be held on November 3. G.

OLIVE HILL, KY.—The city will sell a franchise for an electric light and power plant here, the measure having passed the council in usual form. A rate of 12.5 cents per kilowatt-hour, or a flat rate of 50 cents, based on a 16-candlepower Mazda lamp, is prescribed as the maximum rate under the franchise. G.

FLORENCE, ALA.—A big land deal has just been consummated in the purchase by Col. N. F. Thompson, of Birmingham, of whht is known as the Cypress Creek tract of land, containing 1,000 acres adjoining the corporate limits of the city of Florence, on which are five separate water power sites. It is understood that a company is being formed for the immediate development of the property and negotiations are now pending for the location of three important industries for the utilization of these water powers.

WESTERN STATES.

ANACONDA, MONT.—The City Council, at a recent meeting, passed an ordinance calling for the installation of an electric lighting system on Commercial Avenue. Bids for the work will be received shortly by the City Clerk. O.

ROSWELL, N. M.—The Roswell Gas & Electric Company has been granted a 30-year franchise.

CULDESAC, IDAHO—W. L. Marrs, of Coeur d'Alene, has been granted a franchise to operate an electric light plant in this city. Service is to be established by October 1.

TEMPE, ARIZ.—L. G. Knipe has been engaged to estimate the value of a proposed new electric light and power system for the city. His report is to include both the cost of an entire new system and the present valuation of the Southside Gas & Electrical Company's system.

TACOMA, WASH.—O. R. Kinney, president of the Mutual Electric Light & Power Company, here, recently filed an application with the commissioners of Pierce county, asking for a franchise to use Pioneer Way and other thoroughfares in the Puyallup valley for the extension of electric transmission lines, to furnish current for electric light and power, and for a farmers' telephone system. O.

WENATCHEE, WASH.—Ernest Plummer of Tacoma has secured an option on 400 acres of land adjoining the Priest Rapids power plant of the Pacific Power & Light Company, of Portland, Ore., on the west bank of the Columbia River. This property is owned by R. B. Wilson and Malcolm McLennan of Ellensburg, Wash. The option covers bottom land, which would be flooded by construction of a huge power dam proposed, and it is believed that the option indicates definite plans to develop one of the largest power plants in the Northwest. O.

DRAIN, ORE.—Six thousand dollars will be expended for a municipal lighting system here. Address the city clerk.

HEMET, CAL.—A representative of the Southern Sierras Power Company appeared before the City Council with a proposition for street lighting. No action has been taken in the matter.

LOS BANOS, CAL.—The San Joaquin Light & Power Corporation is preparing to run an additional power line from this city to the Ore Loma country, which will be 16 miles in length.

ORANGE, CAL.—Plans are being considered by the Board of Supervisors, whereby all boulevards of the county will be lighted.

PASADENA, CAL.—The municipal light plant is to be enlarged by the installation of another unit. Bids for the equipment will be received until August 11. The improvements will cost about $30,000.

POMONA, CAL.—An ornamental street lighting system for this city is being considered by the directors of the Chamber of Commerce, who will urge the city to take immediate action on the proposed improvement.

SANTA ANA, CAL.—Articles of incorporation have been filed here for the Pacific Light & Power Company, with a capital stock of $40,000,000 by W. T. Kerchoff, H. E. Huntington, K. Kohn and others.

PROPOSALS.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received for wiring and furnishing electrical equipment for the Lincoln Avenue School, Bellevue, Pa., by W. J. Shaw, architect, Fulton Building, Pittsburgh, from whom blanks and specifications may be secured. N.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 21 for furnishing and installing lighting fixtures in the United States customhouse at Boston, Mass., the United States post office at Minneapolis, Minn., the United States post office and courthouse at Muskogee, Okla., and the United States sub-treasury at San Francisco, Cal., until September 3 for the lighting fixtures of a two-story building for the post office at Winfield, Kans.; and until September 9 of a two-story building for the post office at Holland, Mich.; and until September 14 of a one-story building for the post office at Port Lewis, N. Y., in accordance with drawings and specifications, copies of which may be obtained either from the custodians of the sites named or the office of the Supervising Architect.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 25 for furnishing the following electrical equipment under the schedule numbers given and for delivery at the Navy Yards named: 200 storage batteries, f. o. b. works, 7119; two switchboard or contactor panels, suitable for 20-horsepower shunt-wound 220-volt direct-current motor, 7119, Washington, D. C.; three deck battery covers, 7131, Norfolk, Va.; 32 automatic controlling equipments for operation of engine-room ventilation sets, and spare parts, 7112, Brooklyn, 24; Norfolk, 8; one telephone switchboard, front-connection type, type C-72, and spare parts, 32 commercial telephones, complete, similar to type HB; 72 telephones, HB, DB, D, HBc, complete, and spare parts, all 7122, for Brooklyn, N. Y.; 2,000 five-ampere snap switches, and 5,500 cable terminals, type "V", 7134, Washington, D. C. The Bureau will also receive bids until September 1 for one 7.5-kilowatt turbo-generating set, and spare parts, 7115, Puget Sound, Wash.

NEW INCORPORATIONS.

BOSTON, MASS.—Electric Game Board Company has been incorporated with a capital stock of $100,000 by William H. Gilman, Fred W. Brown and Sumner M. Teele. W.

BOSTON, MASS.—Beaver Contracting & Engineering Corporation has been granted articles of incorporation, capitalized at $25,000. The incorporators are George C. Kenney and L. Gordon Glazier. W.

CLEVELAND, O.—The Wicks Electric Company has been incorporated with a capital stock of $10,000. The incorporators are J. C. Keenan, A. G. Wicks, N. C. Ebert, John Seaman and Herbert Wicks.

CHICAGO, ILL.—Current Electric Company has been incorporated with a capital stock of $60,000 to manufacture and deal in electric heating appliances. The incorporators are Charles R. Barrett, Benjamin Levering and Charles L. Barrett.

CINCINNATI, O.—The Electric Service Company has been incorporated with a capital stock of $10,000 to deal in electrical supplies. The incorporators are John F. Shormaker, Maurice E. Kieley, Thomas J. Kieley, Walter E. C. Retch and Hillman C. Retch.

CITRONELLE, ALA.—The Citronelle Public Service Corporation has been incorporated with a capital stock of $10,000 for the purpose of operating a gas and electric plant, a street-car system and other industries. Edward P. Corey, Citronelle, is president and treasurer; Edwin J. Stebbins, Citronelle, secretary.

NEW PUBLICATIONS.

CHICAGO RAILROADS.—The City Club of Chicago has published a report of George E. Hooker on "Through Routes for Chicago's Steam Railroads." This is a study of the best means of providing transportation for the suburbs of Chicago. It is handsomely gotten up.

CENSUS REPORT ON ELECTRIC UTILITIES.—Bulletin No. 124 of the Bureau of the Census gives statistics for central electric light and power stations and street and electric railways for 1912, preliminary figures for which have already been published in this journal.

LIGHTNING RODS.—Bulletin No. 220 of the Ontario Agricultural College, Toronto, is entitled "Lightning Rods, Their Efficiency, Principles and Installation on Farm Buildings," by W. H. Day. This gives evidence to show the protection afforded by the use of lightning rods.

ELECTRIC FURNACES.—Publication No. 219 of the Bureau of Standards, Washington, D. C., is entitled "The Production of Temperature Uniformity in an Electric Furnace," by A. W. Gray. This explains a method of securing temperature sufficiently uniform for laboratory work.

DISTRICT RAILWAYS.—An abstract of the hearings before the District of Columbia Committee of the House of Representatives on "Municipal Ownership of Street Railways in the District of Columbia" has been published by the Bureau of Public Service Economics, New York City. It contains much interesting testimony.

MASSACHUSETTS REPORT.—The twenty-ninth annual report of the Board of Gas & Electric Light Commissioners of Massachusetts for the year 1913 has been issued. This contains among other things the orders and decisions of the Board and statistics and accounts of the public-utility companies.

POTENTIAL TRANSFORMERS.—Publication No. 217 of the Bureau of Standards, Washington, D. C., is entitled "Testing Potential Transformers," by H. B. Brooks. This describes a method of testing which can be carried out with commercial instruments upon transformers already installed for service.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has published "Results of Observations Made at the United States Magnetic Observatory at Vieques, Porto Rico, in 1911 and 1912," by Daniel L. Hazard. This gives hourly

values of the several components of the earth's magnetic field with the monthly and annual means. There is also a record of earthquakes and magnetic storms.

FINANCIAL NOTES.

The gravity of the European war situation with the unloading of large amounts of American securities on local exchanges, caused a considerable decline in value of even the most substantial industrials. Stock exchanges, therefore, closed for an indefinite suspension of business during the week. Bankers' associations also took precautionary action in exacting 60-day notice from savings depositors for withdrawals, the issuing of Clearing House certificates for interbanking settlements, and the paying out of cashiers' certificates of exchange in lieu of currency.

In the United States District Court in Buffalo on July 21, Judge Hazel appointed James O. Moore and James A. Roberts, receivers for The United States Light & Heating Company following a case in equity. That it was a case in equity and not in bankruptcy was made evident in the hearing. It was outlined by the Court that there should be no interruption in the fulfillment of existing contracts in the prosecution of pending business or in the company's operations in any department. A. H. Ackermann, vice-president and general manager prior to the receivership, was appointed general manager to operate the business because of his familiarity with it, and the entire staff of salesmen, engineers, etc., were retained in their former capacities. Mr. Ackermann has issued the following statement to the trade and to the public: "The action recently sustained in the appointment of the receivers for the property of the company was a necessary step to conserve the assets for the benefit of all. With assets of three dollars for every dollar of debt, the company is amply stable, and the Court's direction to continue the business is the last proof necessary to reassure the buying public. There are already under way plans for broad financing, and with the return of general prosperity in the country, the U. S. L., more aggressive than ever before, intends to secure its own full share of the business and to continue the manufacture and sale of its special electrical products."

The Allis-Chalmers Company reports sales for the quarter ended June 30, 1914, of $2,751,119. Net profits were $14,756. Unfilled orders on hand amounted to $3,086,795.

The United Electric Securities Company has asked tenders until August 11 on as many of its collateral trust five per cent bonds of the twenty-first series as $23,412 will purchase, on as many of the twenty-fifth series as $53,728 will purchase, and on as many of the twenty-eighth series as $73,697 will purchase, a total of $150,838 available for the purchase of these bonds. Bonds accepted will be paid for August 13 with accrued interest.

The Ohio State Telephone Company, which has been organized by Ohio men long identified with the independent telephone companies in that state, has taken over the fifteen Ohio telephone companies which have been controlled for several years by J. P. Morgan & Company. A syndicate of Ohio brokers is offering $3,000,000 seven-per-cent cumulative preferred stock and $900,000 common stock of the new company at $1,000 for 10 shares of the preferred and three shares of the common stock.

Dividends.

	Term	Rate	Payable
Blackstone Val. Gas & Elec. com.	Q	$2.00	Sept. 1
Detroit United Ry.	—	1.5%	Sept. 1

Reports of Earnings.

NEW ORLEANS RAILWAY & LIGHT.

Six months ended June 30, 1914:	
Gross earning	$3,596,462
Net after taxes	1,482,475
Miscellaneous dec.	14,252
Interest on underlying liens	295,361
Interest on general mortgage 4½s.	394,740
Interest on refunding liens	89,525
Interest on debenture notes	74,559
Net income	614,036
Renewals and replacements	130,870
Surplus	483,166

PUGET SOUND TRACTION, LIGHT & POWER.

	1914	1913
May gross	$ 706,471	$ 715,073
Net after taxes	275,431	303,881
Surplus after charges.	100,106	132,168
Twelve months gross.	8,717,662	8,354,255
Net after taxes	3,669,437	3,468,458
Surplus after charges.	1,577,521	1,450,220

NORTHERN STATES POWER.
(With subsidiary companies.)

June gross	$ 307,426	$ 270,310
Net after taxes	152,401	132,782
Six months gross	1,319,343	1,175,700
Net after taxes	673,673	562,468
12 months gross	4,078,541	3,745,841
Net after taxes	2,122,539	1,894,581
Surplus after charges.	881,774	716,510
Balance after preferred dividends	294,705	162,497

AMERICAN LIGHT & TRACTION.

	1914	1913
Year ended June 30, 1914:		
Earnings on stocks of subsidiaries owned	$3,697,743	$3,781,422
Miscellaneous earnings.	717,867	579,130
Total gross earnings.	4,415,610	4,360,553
Expenses	139,465	119,831
Net earnings applicable to dividends	4,276,144	4,240,721
Surplus and reserve previous year	8,973,146	8,140,611
Total surplus	13,249,291	12,381,333
Preferred dividends	854,172	854,172
Cash dividend commission	1,408,727	1,277,007
Stock dividends commission	1,408,727	1,277,007
Total dividends	3,671,627	3,408,187
Surplus balance	9,577,664	8,973,146

MASSACHUSETTS ELECTRIC COMPANY.

The Massachusetts Electric Company reports for the quarter and twelve months ended June 30, 1914, as follows:

Quarter ended June 30:	1914	1913
Gross	$2,498,786	$2,433,945
Net	953,696	874,226
Surplus after charges.	429,151	360,292
Twelve months ended June 30:		
Gross	9,695,249	9,462,251
Net	3,331,280	3,352,740
Surplus after charges.	1,324,296	1,437,838

ROCHESTER TELEPHONE.

The Rochester Telephone Company reports for the six months ended June 30, 1914, as follows:

	1914	1913
Gross	$ 241,102	$ 228,374
Net	97,670	73,541
Surplus after charges.	70,904	46,743

CHATTANOOGA RAILWAY & LIGHT.

	1914	1913
June gross	$ 91,477	$ 101,635
Net after taxes	33,043	41,169
Surplus after charges.	4,853	17,965
Twelve months gross.	1,162,036	1,161,121
Net after taxes	454,908	466,872
Surplus after charges.	134,117	185,769
Balance after preferred dividends	34,117	85,769

BANGOR RAILWAY & ELECTRIC.

	1914	1913
June gross	$ 71,595	$ 60,780
Net after taxes	30,380	31,867
Surplus after charges.	12,813	14,669
Twelve months gross.	782,952	735,690
Net after taxes	417,951	400,870
Surplus after charges.	209,160	196,002
Balance after preferred dividends	*104,160	91,002

*Equivalent to 5.2 per cent on common stock.

COLUMBUS RAILWAY POWER & LIGHT.

	June, 1914	Six Mos.
Gross earnings	$249,684	$1,521,742
Net after taxes	79,733	544,869
Surplus after charges.	37,371	270,235
Balance after preferred dividends	17,026	158,165

CONSUMERS POWER OF MINNESOTA.

Twelve months ended May 31:	1914	1913
Gross earnings	$4,041,425	$3,721,003
Expenses and taxes	1,938,506	1,851,521
Net earnings	2,102,919	1,689,482
Charges on underlying bonds	889,377	.....
Charges on Con. Pow. bonds	342,850	.....
Surplus after all charges	870,691	.....

PORTLAND RAILWAY, LIGHT & POWER.

	1914	1913
June gross	$ 530,974	$ 568,875
Net after taxes	247,925	277,191
Surplus after charges.	63,938	105,653
12 months' gross	6,701,878	6,683,215
Net after taxes	3,357,268	3,373,076
Surplus after charges.	*1,241,067	1,521,290

*Equivalent to 5 per cent on capital stock.

REPUBLIC RAILWAY & LIGHT.

Earnings of Republic Railway & Light and subsidiary companies for June and 12 months were:

	1914	1913
June gross	$ 248,874	$ 248,792
Net after taxes	98,863	93,453
Surplus after interest, amortization, and preferred dividends	15,330	9,109
12 months' gross	3,093,847	2,844,333
Net after taxes	1,210,682	1,086,739
Surplus after interest, amortization, and preferred dividends	194,515	142,318

SAN JOAQUIN LIGHT & POWER CORPORATION.

	1914	1913
June gross	$ 153,757	$ 141,372
Net after charges	92,694	77,677
Surplus after charges.	50,368	42,627
Six months' gross	919,729	831,802
Net after taxes	577,976	488,846
Surplus after charges.	324,456	285,434

MT. WHITNEY POWER & ELECTRIC.

	1914	1913
June gross	$ 57,435	$ 49,574
Net after taxes	38,680	25,295
Surplus after charges.	26,295	16,849
12 months' gross	627,248	491,774
Net after taxes	359,150	257,909
Surplus after charges.	230,726	160,835

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 3	July 27
American Tel. & Tel. (New York)	116¼	119½
Commonwealth Edison (Chicago)	130	135
Edison Electric Illuminating (Boston)	238	249
Electric Storage Battery common (Philadelphia)	42½	51½
Electric Storage Battery preferred (Philadelphia)	42½	51½
General Electric (New York)	140	146
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	9½	10¼
Massachusetts Electric preferred (Boston)	57	58
National Carbon common (Chicago)	112	116
National Carbon preferred (Chicago)	105	120¼
New England Telephone (Boston)	130	130
Philadelphia Electric (Philadelphia)	21½	24½
Postal Telegraph and Cables common (New York)	60	80
Postal Telegraph and Cables preferred (New York)	65	67
Western Union (New York)	53⅜	58¼
Westinghouse common (New York)	65	77½
Westinghouse preferred (New York)	115	122

PERSONAL MENTION.

MR. J. M. SMITH, until recently in charge of the engineering department of the Crocker-Wheeler Company, has become connected with the Triumph Electric Company, of Cincinnati, O., assuming his duties there on August 1.

MR. C. R. LININGER has been appointed manager of the branch office, in charge of the Western district, at 724 Harris Trust Building, Chicago, just established by the Pittsburgh Transformer Company, of Pittsburgh, Pa.

MR. E. R. KOHLHASE has been appointed district plant chief of the Cumberland Telephone Company at Knoxville, Tenn., succeeding MR. O. C. RAUCHENBERG, who has been appointed division plant chief of the Georgia division.

MR. LAURENCE E. MORIER has been appointed manager of the new office at Columbus, O., which has been established by the Naugle Pole & Tie Company, of Chicago. Mr. Morier has been affiliated with the company for the last nine years, starting in the capacity of time keeper and assistant

Laurence E. Morier.

foreman in the Chicago yards. After three years of this work he was transferred to the north, acting as assistant to the superintendent of Minnesota operations. He was later recalled to Chicago and achieved a conspicuous success in the selling organization. His practical experience in all branches of the pole business has fitted him especially well for his new work.

MR. N. E. MADDOX, who has been employed for the past year and a half as a fixture specialist by the Inter-Mountain Electric Company, of Salt Lake City, has resigned to accept a position in a similar capacity for L. A. Hufschmidt Manufacturing Company, of San Francisco. Mr. Maddox has laid out the fixture installations for some of the principal business blocks and residences completed in Salt Lake City recently.

MR. E. L. DEE, special lamp salesman for the Western Electric Company, at Salt Lake City, was in Cleveland last week attending the convention of Sunbeam lamp salesmen at Nela Park. Mr. Lee has been specializing for the past two months on the sale of the new Type C Mazda units for exterior-lighting purposes among the merchants of Salt Lake City and has been highly successful. A large number of these units has been installed and these are giving most excellent satisfaction.

MR. THOMAS G. GRIER, Western manager of Harvey Hubbell, Inc., and vice-president of the 1900 Dry Battery Company with headquarters at Chicago, made a recent trip through the Yellowstone National Park. Mr. Grier is a pioneer electrical manufacturer's agent and recalls with pride the fact that he sold the entire electrical equipment for the celebrated Salt Lake Temple, which was in course of erection for 40 years and completed in 1890.

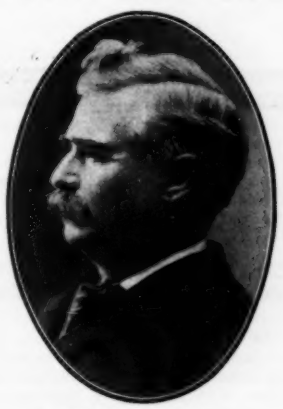
MR. A. W. PEARD, sales manager of the Spencer Turbine Cleaner Company, of Hartford, Conn., was in Salt Lake City last week in connection with several important vacuum-cleaner contracts which are to be let in the near future. His company operates through the Capital Electric Company and after completing his work in Salt Lake City, Mr. Peard will visit the Capital Company's various branch houses in order to familiarize the branch salesmen with the merits of the company's products.

MR. JOHN MONTGOMERY, commercial agent of the Western Canada Power Company with headquarters at Vancouver, B. C., has been taking a three-weeks vacation, visiting with relatives and friends in Salt Lake City, points in Wisconsin, and Idaho. Mr. Montgomery for several years held the position of commercial agent with the Utah Light & Railway Company, during which period the company experienced a most substantial growth. When Mr. R. J. Hayward resigned as engineer of the company to take charge of the properties at Mexico City, which had been acquired by Canadian and English capital, Mr. Montgomery went with him and organized the commercial forces of the company in that city, where he remained until the property was sold. Mr. Hayward then took up the development of a large hydroelectric proposition in British Columbia, and Mr. Montgomery again joined him to handle the commercial end of the business, where he is still engaged.

MR. ERNEST E. LEE has resigned as superintendent of erection in the Division of Erection of the office of the engineer of maintenance, Ancon, Canal Zone, Isthmus of Panama, and has returned to the United States. Mr. Lee was appointed to the Canal service as assistant engineer in the old Department of Lock and Dam Construction on December 2, 1907, and was placed in charge, under the electrical and mechanical engineer, of the drafting force for the preparation of the designs for the operating machinery of the locks, and plans for the Atlantic and Pacific generating stations. When the Department of Lock and Dam Construction was abolished, he was transferred to the electrical and mechanical subdivision of the First Division of the chief engineer's office, and on December 1, 1909, he was promoted to the position of assistant electrical and mechanical engineer. On September 1, 1911, he was appointed superintendent of erection and placed in local charge of the installation of all of the operating machinery and electrical equipment for locks, spillways, Gatun hydroelectric station, substations, and transmission line. Prior to his coming to the Isthmus, he was with the Commonwealth Edison Company, of Chicago, at two different periods; first, in 1902 and 1903, as draftsman; and again in 1904 and 1905, engaged in designing and inspection. During a part of 1903, he was employed by the American Blower Company, of Detroit, as selling and ventilating engineer, and in 1906 and 1907, he was superintendent of mechanical, electrical, and building construction at Evansville, Ind., for John A. Radford, of Chicago. His future address will be Stratford Apartment N., Evansville, Ind.

OBITUARY.

MR. WILLIAM EDWARD CLARK, a representative of the Rail Joint Company, New York, died after a brief illness at Charlestown, N. H., on July 5. Mr. Clark was born in Manchester, November 5, 1847. He was a descendant of the Puritan settlers of New England, and enlisted in the Navy at the age of 16, serving for three years during the Civil War and participated in the capture of Fort Fisher, in January, 1865. Soon after the war he engaged in bridge building, later becoming road master of the Connecticut division of the Boston & Maine, where he was employed for nearly 25 years. About 1897 he accepted a position with



William E. Clark.

the Rail Joint Company of America, acting as general representative and traveling for the company in every part of the country.

MR. JAMES WOLFF, one of the best beloved, most highly esteemed men in the electrical industry, died on Thursday, July 30, at the Sacred Heart Sanitarium, Milwaukee, aged 52. Mr. Wolff was for many years Western representative of the New York Insulated Wire Company, H. T. Paiste Company and other well established lines. For more than a quarter of a century he was an active exponent of more than the square deal in business as it affected the various elements of the trade, and he has taken a conspicuous part in promoting ideals of salesmanship and business ethics throughout the industry. Eighteen years ago he was elected secretary *pro tem* of a meeting of electrical manufacturers and jobbers convened at the Tremont House, Chicago, to organize the Electrical Credit Association of Chicago. He served on the Executive Committee for many years. On October 7, 1898, he was one of the charter delegates to the Cincinnati convention which resulted in the formation of the National Electrical Credit Association, on the Board of Managers of which he served until April 1, 1913.

DATES AHEAD.

Southeastern Section, National Electric Light Association. Annual convention, Isle of Palms, Charleston, S. C., August 19-21. Secretary, A. A. Wilbur, Columbus, Ga.

American Peat Society. Annual meeting, Duluth, Minn., August 20-22. Secretary, Julius Bordello, 17 Battery place, New York, N. Y.

New England Section, National Electric Light Association. Sixth annual convention, Narragansett Pier, R. I., September 2-4. Secretary, Miss O. A. Bursiel, 149 Tremont street, Boston, Mass.

The Colorado Electric Light, Power and Railway Association. Twelfth annual convention, Glenwood Springs, Colo., September 3-5. Secretary, Thomas F. Kennedy, 900 Fifteenth street, Denver, Colo.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 8-11. Secretary, S. E. Pohe, Bloomsburg, Pa.

Northwest Electric Light & Power Association. Annual convention, Spokane, Wash., September 8-11. Secretary, Norwood W. Brockett, Puget Sound Traction, Light & Power Company, Seattle, Wash.

American Institute of Electrical Engineers. Pacific Coast convention, Spokane, Wash., September 9-11. Secretary, F. L. Hutchinson, 29 West Thirty-ninth street, New York, N. Y.

Electrical Supply Jobbers' Association. Regular quarterly meeting, Clifton Hotel, Niagara Falls, Canada, September 9-11. General secretary, Franklin Overbagh, 411 South Clinton Street, Chicago.

Association of Edison Illuminating Companies. Annual convention, White Sulphur Springs, W. Va., September 14-17. Secretary, George C. Holberton, San Francisco, Cal.

Association of Iron and Steel Electrical Engineers. Annual convention, Cleveland, O., September 14-19. Secretary, W. T. Snyder, McKeesport, Pa.

Old-Time Telegraphers' and Historical Association and Society of the United States Military Telegraph Corps; Thirty-third annual reunion, Kansas City, Mo., September 15-17. Secretary of Old-Timers, F. J. Scherrer, 30 Church street, New York. Secretary, Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

International Association of Municipal Electricians. Annual convention, Atlantic City, N. J., September 15-18. Secretary, C. R. George, Houston, Tex.

Illuminating Engineering Society. Annual convention, Cleveland, O., September 21-25. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-sixth general meeting, Niagara Falls, N. Y., October 1-3. Secretary, Joseph W. Richards, South Bethlehem, Pa.

American Electric Railway Association. Annual convention, Atlantic City, N. J., October 12-16. Secretary, E. B. Burritt, 29 East Thirty-ninth Street, New York, N. Y.

Jovial Order, Annual congress, St. Louis, Mo., October 14-16. Mercury, Ell C.Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Fifth annual convention, Philadelphia, Pa., October 19-21. Secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual reunion, Richmond, Va., October 29-30. Secretary, Henry W. Pope, New York City.

With the Electrical Manufacturers

Rome Wire Company, Rome, N. Y., has issued its August calendar containing an excellent color reproduction of a picture entitled, "The Enchantress."

Davis Slate & Manufacturing Company, Chicago, Ill., is mailing a folder giving prices on various grades of slate for switchboards and other electrical apparatus.

Union Electric Company, Trenton, N. J., has recently issued several folders illustrating and describing sign receptacles, two-piece plugs, brass-cap attachment plugs, weather-proof and composition sockets, snap switches and sockets.

Doehler Die Casting Company, Brooklyn, N. Y., has issued a bulletin describing and illustrating interesting die-cast work. This bulletin also explains the possibilities of the die-casting process and the economies of using die castings.

Ohio Distributing Company, 220 Lomax Place, Chicago, Ill., is the name of a firm which recently established itself as manufacturers' representative. This firm represents the Steel City Electric Company, the Western Conduit Company, the Brown Rubber Company and the National Electrical Porcelain Company.

The Brown Instrument Company will occupy its new factory at Wayne and Windrim Avenues, within a half block of Wayne Junction Station, Philadelphia, Pa., about October 1. The building is two stories in height, of the most modern construction for facilitating the manufacturing and calibration of scientific instruments. A power plant will be installed.

The Ohio Brass Company, Mansfield, O., has recently issued the July number of the O-B Bulletin. This bulletin is published monthly. The present number contains an article on "Personal Efficiency" and one on the "Installation of Soldered Ears and Splicers." Many of the company's trolley-car and trolley-wire devices are shown.

General Electric Company., Schenectady, N. Y., has recently issued a power number of *The Electrical Advertiser.* This number contains a number of sales helps in connection with motor devices. Numbers advertising cuts designed to aid in the preparation of newspaper campaigns are shown. Electrotypes of these advertisements may be obtained free by firms selling the company's products.

The Terry Steam Turbine Company, Hartford, Conn., announces that it has appointed Fidanque Brothers & Sons, of New York City and Panama, as its representative in the Republic of Panama and the Canal Zone. The main office of Fidanque Brothers & Sons is at 15 Whitehall Street, New York City. The company also announces that its Cleveland office, which is in charge of L. A. Finlay, has been removed from 710 New England Building to 503 Union Building.

The British Aluminum Company, Toronto, Canada, has recently issued a very attractive bulletin on aluminum insulated cables. This bulletin first discusses the difference between aluminum and copper with respect to economy, ease of working and jointing, and scrap value, the discussion going into considerable detail. Tables are then given showing the comparative ratings of copper and aluminum cables in accordance with American, Canadian, British, French, German and Swiss standards. The remainder of the bulletin is devoted to descriptions and discussions on high and low-tension aluminum cables. Several valuable tables are given and excellent illustrations are included.

The United Electric Stores, Incorporated, Los Angeles, Cal., has been organized to acquire and operate a chain of electrical stores on the Pacific Coast under one management and control. Store No. 1 is now in operation at the corner of Hill and Eighth Streets, at Los Angeles. The United Electric Stores, Incorporated, is capitalized at $50,000, divided into 5,000 shares, par value $10. There are 1,500 shares of common stock and 3,500 shares of preferred stock, the latter bearing interest at seven per cent. Max Loewenthal is president and general manager of the organization. Mr. Loewenthal has had a wide experience in the electrical industry and is well known as a capable electrical engineer and executive throughout the country.

The Safety Insulated Wire & Cable Company, of New York, has published a very handsome booklet devoted to Safety steel-taped cable for underground transmission without the use of conduits. This describes the manufacture of Safety cable and its applica-

tions for underground construction of every description. There are a great many interesting illustrations showing the way in which Safety steel-taped cable may be economically applied. There are also estimates and specifications together with other engineering information which indicate the economy of construction and establish comparisons for the guidance of the engineer. Copies of the bulletin will be forwarded to those interested upon request to the company or to M. B. Austin & Company, western managers, 700 West Jackson Boulevard, Chicago, Ill.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces the receipt of the following orders: Brooklyn Edison Company, Brooklyn, N. Y., one 2,500-kilowatt frequency-changer set consisting of one 2,500-kilowatt two-phase 61.2-cycle alternator and one 2,860-horsepower 3 phase 25-cycle type-HF induction motor. Johns Hopkins University, Baltimore, Md., one 100-kilowatt 3-wire generator; one 100 kilowatt 3-wire, turbogenerator unit. Lakewood Water Light & Power Company, Lakewood, N. J., five 150-kilowatt transformers, 13,200 - 2,200 - volts, single phase. Northern Ohio Traction & Light Company, Akron, O., one 5,000 kilowatt transformer. Lake Shore Electric Railway Company, Sandusky, O., three 185-kilowatt, single-phase, 17,350-456-volt transformers, one 15-kilowatt induction-motor-generator set for exciter service. J. A. Vandergrift, Lebanon & Ephrata Railway Company, Lebanon, Pa., two 300-kilowatt, 25-cycle commutating-pole rotary converters and two three-panel switchboards to control same; two 250-kilowatt transformers, outdoor type, 3 phase; one complete portable substation car including 300-kilowatt rotary converter, one 250-kilowatt 11,000-volt outdoor-type transformer, and necessary switching equipment. Town of Harrisonburg, Harrisonburg, Va., one 300-kilowatt coupled-type vertical water-wheel-driven generator; three 150-kilowatt 11,000-2,400-volt outdoor-type transformers; one three-bearing 25-kilowatt induction-motor-generator set for exciter service; and one two-panel switchboard for the control of same. Northern Texas Traction Company, Stone & Webster Engineering Corporation, one 1,000-kilowatt commutating-pole rotary converter; three 367-kilowatt transformers. Wausau Sulphate Fibre Company, Mosinee, Wis., one 250-horsepower adjustable-speed direct-current motor, with complete automatic control; one 200-kilowatt motor-generator set for drive of paper machine motor; two 300-horsepower motors for jordan drive; three 500-kilowatt water-cooled transformers, and one 100-horsepower motor for beater drive. The Southern Iowa Railway & Light Company one 200-kilowatt, 3-phase rotary converter; one 150-kilowatt motor-generator set consisting of one 150-kilowatt 3-wire generator and one 182-kilowatt, 3-phase motor; three 75-kilowatt rotary-voltage transformers; one 11-panel switchboard; two three-phase autotransformers; two 17-kilowatt regulators; 186 street hoods; 50 brackets; 19 arc lamps, 19 current transformers.

Record of Electrical Patents.

Issued by the United States Patent Office, July 28, 1914.

1,104,781. Time-Operating Mechanism for Electric Switches. L. G. Copeman, assignor to Copeman Electric Stove Co., Flint, Mich. A switch-actuating arm engages winding stem of alarm-clock mechanism.

1,104,784. Dynamo-Electric-Machine Frame. G. Dunn, assignor to Crocker-Wheeler Co., Ampere, N. J. Has special centering means.

1,104,785. Motor-Control System. G. Dunn, assignor to Crocker-Wheeler Co. A motor-generator set with automatic resistance-controlling contactors.

1,104,793. Electrical Generating System. L. V. Grillett and J. B. Truchetet, Paris, France. Commutator has axial and oblique segments whereby by shifting brushes the number of commutator bars embraced may be varied.

1,104,795. Magneto. E. Hähnlen, assignor to Holtzer-Cabot Electric Co., Boston, Mass. An automobile magneto, the driving means for which is controlled from steering post.

1,104,796. Electric-Circuit Regulator. C. Aalborg, assignor, to Westinghouse Electric & Mfg. Co. Has pulley-controlled movable cores independently operated.

1,104,800. Motor Controller. A. J. Horton, assignor to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. A combined rheostat and reversing device.

1,104,807. Electric Incandescent Lamp. A. S. Knight, assignor to Westinghouse Lamp Co. A tubular lamp with a number of filaments.

1,104,828. Galvanic Battery. J. E. Preston, Stockport, England. Covers details of electrode supports and jar-sealing means.

1,104,835. Magneto Ignition Device, F. Schröter and F. L. Mädler, Wilmersdorf-Berlin, Germany. A battery-magneto ignition system.

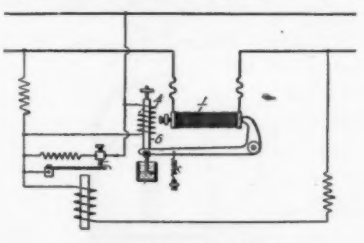
1,104,841. Resistance Set. I. B. Smith, assignor to The Leeds & Northrup Co., Philadelphia, Pa. Means for operating sliding contact without short-circuiting adjacent stationary contacts.

1,104,849. Voltage Regulator. W. A. Turbayne, assignor to Central Trust Co. of New York, Buffalo, N. Y. For train-lighting systems. (See cut.)

1,104,860. Ignition Apparatus for Internal-Combustion Engines. G. V. Ahara, assignor to Fairbanks, Morse & Co., Chicago, Ill. Covers mechanical connection of magneto.

1,104,898. Method of Making Storage-Battery Electrodes. H. C. Hubbell, Newark, N. J. Precipitated active material mixed without drying and formed into plates.

1,104,930. Electric Wall Box. J. G. Raquette, assignor to The Universal Switch Box Co. A wall-outlet box.



1,104,849.—Voltage Regulator.

1,104,931. Socket for Incandescent Electric Lamps. A. C. Recker, assignor to Waterbury Mfg. Co., Waterbury, Conn. Has a supporting ring attached to socket.

1,104,939. Electric Musical Instrument. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Mfg. Co. A solenoid-operated piano, variations in tone being obtained by varying resistance.

1,104,949. Electric Recorder. J. L. Zander, assignor to Charles O. Sander, Irvington, N. J. A recording instrument.

1,104,956. Telephone-Operator's Equipment. W. G. Blauvelt and F. C. Molina, assignors to American Telephone & Telegraph Co. Automatic means located at exchange for connecting operator with calling party.

1,104,959. Vacuum Lightning Arrester. F. S. Chapman, assignor to The National Electric Specialty Co., Toledo, O. Discharge cannot follow straight line between electrodes.

1,104,960. Lightning Arrester. F. S. Chapman, assignor to The National Electric Specialty Co. A vacuum-tube arrester with three electrodes.

1,104,961. Lightning Arrester. P. H. Chapman and H. M. Pingen, assignors to The National Electric Specialty Co. A vacuum-tube arrester.

1,105,014. Transformer. W. M. Austin, Zelienople, Pa. Has radial legs and hollow core.

1,105,015. Electrolytic Cell. D. B. Ayerst, Wilmington, Del. For electrolyzing saline solutions.

1,105,029. Automatic Commutator for Radio-Telegraphic Plants with Indirect Excitation. E. Girardeau, Paris, France. Assignor of one-half to J. Bethenod. A switch for permitting messages to be heard during sending intervals.

1,105,035. Automobile Light. A. L. McMurtry, Sound Beach, Conn. Head and rear lights controlled by position of running lever.

1,105,038. Reflector Cluster. O. A. Mygatt, New York, N. Y. Each portion of reflector designated to properly reflect light from lamp cluster.

1,105,044. Fire-Alarm System. E. Schumann, assignor to Siemens & Halske, A. G., Berlin, Germany. An electromagnet-controlled system.

1,105,050. Support for Filaments. W. R. Whitney, assignor to General Electric Co. A short tungsten wire supports tungsten-lamp filament.

1,105,064. Spark Plug. E. W. Cole, Wharton, Tex. Accumulation of carbon establishes connection between electrode and conductor.

1,105,066. Telephonic Transmitter. J. J. Comer, assignor, by mesne assignments, to The Webb Talking Picture Co., An electric transmitter for talking machines.

1,105,070. Artificial Resistance. G.

J. Gage, assignor to Gage Electric Co., Spokane, Wash. Formed of carbon and carborundum.

1,105,083. Electric-Light Support. D. C. Lamb, assignor to Lamb Bros. & Greene, Nappanee, Ind. A portable lamp support.

1,105,144. Dry-Battery Container. H. T. Johnson, New York, N. Y.; N. F. Johnson, administratrix. A carton for holding batteries.

1,105,155. Self-Regulating Dynamo. J. N. Mueller, Detroit, Mich. Field poles shunted by yoke having an opposing winding.

1,105,175. Rotary Electric Furnace. A. S. Bemis, assignor to National Carbon Co., Cleveland, O. Material fed through hollow rotating electrode onto another rotating electrode.

1,105,194. Selective Mechanical Operator. E. R. Gill, assignor to Hall Switch & Signal Co. An impulse selector.

1,105,231. System of Electrical Distribution. J. L. Woodbridge, Philadelphia, Pa. A battery and booster arrangement with vibrator and condenser in booster's field circuit.

1,105,232. System of Electrical Distribution. J. L. Woodbridge. A storage battery stores energy from a lightly loaded phase and delivers same to a heavily loaded phase.

1,105,265. Support for Axle-Driven Light Generators. C. F. Frede, assignor to Double Body Bolster Co., St. Louis, Mo. A bracket support.

1,105,267. Insulating Block. A. Edgar Goetz, New York, N. Y. An insulator.

1,105,284. Electrical Outlet Box and the Like. A. McMurtrie, assignor to Thomas & Betts Co., New York, N. Y. Has adjustable supporting clamps. (See cut.)

1,105,293. Magnetic Separator. H. J. H. Nathorst, Malmberget, Sweden. A cylindrical magnetic separator.

1,105,305. Lamp-Socket Shell. H. E. Reeve, New York, N. Y. Covers details of cap-fastening means.

1,105,311. Alternating-Current Electromagnetic Switch. A. Sundh, assignor to Otis Elevator Co., Jersey City, N. J. An adjustable electric switch.

1,105,323. Addressing Machine. S. C. Cox, assignor to Cox Multi-Mailer Co., Augusta, Me. Is electrically operated.

1,105,344. Telephone System. E. R. Corwin, assignor to Frank B. Cook Co., Chicago, Ill. An automatic exchange.

1,105,345, 1,105,346 and 1,105,347. Telephony. E. R. Corwin, assignor to Frank B. Cook Co. Covers details of automatic systems.

1,105,348. Telephone System. C. A. Bals, assignor to Frank B. Cook Co. An intercommunicating system.

1,105,349. Switching Mechanism. C. A. Bals, assignor to Frank B. Cook Co. For intercommunicating system.

1,105,350. Signaling System. M. L. Johnson, assignor to Frank B. Cook Co. Signals for intercommunicating system.

1,105,361. Ignition Dynamo. C. T. Mason, assignor to Sumter Electrical Co. An ignition dynamo.

1,105,370. Steering-Post Light. A. S. Oliver, Jr., Medical Lake, Wash. Means for mounting and controlling lamp on steering post of automobiles.

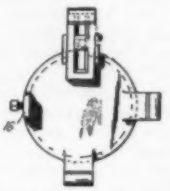
1,105,385. Protecting High-Voltage Transformers. M. O. Troy, assignor to General Electric Co. A series transformer takes concentration of potential that develops in end turns.

1,105,392. Circuit Protection. G. Wright, assignor to General Electric Co. Circuit-closing means opens after excessive current conditions have ceased.

1,105,436. Police and Fire-Alarm System. G. L. Hughes, Chicago, Ill., assignor of one-half to R. E. Cooper. A telephone system.

1,105,465. Excess-Electric-Current Indicator. J. Stone, assignor to Excess Indicator Co. Covers details.

1,105,481. Electrical Measuring Instrument. R. P. Brown, assignor to Keystone Electrical Instrument Co.,



1,105,284.—Outlet Box.

Philadelphia, Pa. An electrical indicating instrument.

1,105,485. Intercommunicating Telegraph or Telephone Device. A. C. Carlson, Butler, Pa. A jack for controlling circuits.

1,105,489. Electrical Contact. E. E. Clement, Washington, D. C. A blank for electrical contacts.

1,105,490. Telephone-Exchange System. E. E. Clement, Washington, D. C. A semi-automatic system.

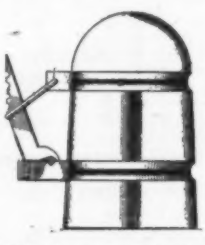
1,105,491. Electrical Selective Switch. E. E. Clement. An automatic selector.

1,105,492. Telephone-Exchange System. E. E. Clement, Washington, D. C. An impulse-controlled automatic exchange.

1,105,499. Storage-Battery Plate. R. Drambourg, New York, N. Y. Covers details.

1,105,521. Insular Attachment. J. A. Kephart, Wellston, Okla. Has wire-holding device. (See cut.)

1,105,538. Electric Furnace. H. F.



1,105,521.—Insulator Attachment.

D. Schwahn, Belleville, Ill. Covers details.

1,105,545. Telephone-Exchange System. E. E. Clement, Washington, D. C. Includes multiple signal impulse device.

1,105,552. Magnetic Chuck. L. W. Downes, Providence, R. I. An electromagnetic chuck.

1,105,557. Arrester for Strong Currents. H. W. Garton, Brooklyn, N. Y. Designed to prevent flow of normal currents to ground.

1,105,563. Telephony. M. L. Johnson, assignor to F. B. Cook Co., Chicago, Ill. An automatic system.

1,105,564. Telephony. C. A. Bals, assignor to F. B. Cook Co. Covers details.

1,105,589. Telephone-Exchange System. E. E. Clement, assignor, to F. C. Stevens, Attica, N. Y. An automatic exchange system.

Patents Expired.

The following United States electrical patents expired August 3, 1914.

587,296. Electric Bale-Tie Machine. W. O. Bates, and W. J. Hutchins, Joliet, Ill.

586,311. Regulating Admission of Currents to Motors. F. E. Herdman, Winnetka, Ill.

587,336. Telegraphy. F. M. Short, Cleveland, O.

587,340. Operating Alternating Motors. C. P. Steinmetz, Lynn, Mass.

587,343. Electric Furnace. G. S. Strong, New York, N. Y.

587,379. Dynamo-Electric Machine. E. P. Warner and H. H. Wait, Chicago, Ill.

587,405. Signal for Telephone Switchboards. C. E. Scribner, Chicago, Ill.

587,406. Apparatus for Telephone Switchboards. C. E. Scribner.

587,421. Electric Arc Lamp. S. Bergmann, New York, and E. Lavens, Brooklyn, N. Y.

587,433. Electric Signaling Apparatus. Du Perow, Washington, D. C.

587,435. Automatic Telephone System. M. Freudenberg, Paris, France.

587,436. Electrotherapeutic Apparatus. F. Geiger, Philadelphia, Pa.

587,441. Regulating Apparatus for Electrically Driven Mechanism. W. H. Knight, Newton, and W. B. Potter, Lynn, Mass.

587,442. Method of Regulating Electrically Driven Mechanism. W. H. Knight, Newton, and W. B. Potter, Lynn, Mass.

587,458. Electric Switch. H. W. Smith, Pittsfield, Mass.

587,465. Electric Arc Lamp. E. F. Taylor, West Chester, Pa.

587,467. Telephone Central-Station Signaling Circuit. G. K. Thompson, Malden, Mass.

587,502. Central-Office Switchboard System. W. S. Harrison and E. M. Harrison, Chicago, Ill.

587,507. Electric Signal Device for Elevators. O. Raacke, and G. Hensel, St. Louis, Mo.

587,531. Electric Motor or Dynamo-Electric Machine. R. Lundell, Brooklyn, N. Y.

587,534. Electric Alarm for Cars. A. Nathan, New York, N. Y.

587,565. Electric Signal Box. A. T. Whittlesey and F. B. Dodge, Cleveland, O.

587,573. Dynamo-Electric Machine. V. A. Fynn, Erith, England.

587,576. Dynamo-Electric Machine. C. M. Green, Cleveland, Ohio.

587,593. Telephone Transmitter. O. Moran, New York, N. Y.

587,594. Electric Contact. A. J. Moxham, Lorain, O.

587,614. Electric Wire Holder. C. J. Stram, Waterman, Ill.

587,625. Automatic Switch Mechanism. J. E. Tyron, Detroit, Mich.

587,642. Electric Contact Box. W. M. Brown, Johnstown, Pa.

587,649. Electrocution Chair. E. F. Davis, West Caton, N. Y.

587,654. Telephone Transmitter. O. A. Enholm, New York, N. Y.

587,663. Telautograph. G. S. Tiffany. Highland Park, Ill.

587,674. Electric Railway. R. M. Hunter, Philadelphia, Pa.